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FUNDAMENTAL BELIEFS AND PRESUPPOSITIONS

held on Sat. March 15th 1997 at Regents Park Theological College, Nantwich, Cheshire.

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Speakers at the conference:

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MICHAEL POLANYI TODAY

A WEEK-END CONFERENCE

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at Halifax Hall, University of Sheffield

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Papers, which need not focus narrowly on Polanyi, are invited

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R. T. Allen

In this paper I propose briefly to define what presupposing is and what presuppositions are, and to outline a way out of the contemporary Scepticism and Relativism regarding them and consequently all of our life and thought. I shall do this with reference to the two great philosophers of presuppositions and presuppositional philosophy, Michael Polanyi and R.G. Collingwood, though I shall merely touch upon the principal elements in their thinking.

1 The contemporary problem with presuppositions

I think we can take it for granted today that the enterprise of critical, justificatory or foundational philosophy has come to an end, that no one any longer seeks critically to examine and to justify our fundamental beliefs, categories, presuppositions, schemata, frameworks, and so forth. For one thing, the desire, in Husserl's words, for a 'rigorous' and 'presuppositionless' philosophy, itself presupposes that such an endeavour is possible. Equally, we can also take it for granted that the Positivist claim has been refuted, that it is not the case that in natural science, or some parts of it, and its basis in perception we can find pure experience and knowledge uncontaminated by anything we bring to it, especially metaphysical beliefs and conceptions about the structure of the world.

As Polanyi, and following him Kuhn and Feyerabend have shown, and as Dr Preston and Fr Moleski will explain in more detail, natural science is not the impersonal application of a mechanical method, whether Bacon's or Mill's rules of induction or Popper's falsification of randomly generated hypotheses

to be stored away in some third world of libraries and data-banks. Its emergence and subsequent development are governed by the creation of quite new ways of thinking about the world as well as by the routine accumulation of new observations and experimental results. In *The Idea of Nature*, Collingwood traced the successive world-pictures of European science, from its origins among the Ionians to Einstein. And perception itself inevitably creates in our minds a conception of the earth as at rest while things move on its surface and sun, moon and stars move over it (PK p. 296). We are born geocentrics and flat-earthers, until and if we are taught otherwise.

Nor can we escape philosophy and fundamental beliefs by retreating with Wittgenstein Marks I and II to the impoverished meanings of the language of a science interpreted, respectively, as picturing or verification, or with Wittgenstein Mark III to the games of a supposedly ordinary and unphilosophical language. For, as Polanyi pointed out, the learning of a language itself depends upon the use of induction and commits us to belief in its validity and efficacy (PK p. 315), and the language that we learn embodies in its vocabulary (i.e. the vocabulary which it actively uses for referring to and dealing with the world, and not remnants of previous vocabularies, such as 'ghost' today, which are now used only in fiction, in referring to the unendorsed beliefs of others, or in casual, meaningless oaths) our view of the world and our inventory of its contents (PK p.112). The languages of modern Europeans embody world-views very different from those of such as the Azande, which, for example,

cannot express the idea of accidental death (PK pp. 287-94).

We bring to experience frameworks, schemata and categories which cannot be wholly derived from experience, for they determine what we regard as genuine or illusory experience. We can be taught by experience only insofar as we regard it as veridical. As Collingwood said (in 'Faith and Reason' p. 139¹), 'We thus possess certain pieces of knowledge about the world [that it is a unity, that there are laws of nature, that conclusions following logically from true premisses are themselves true] which we did not acquire, and cannot criticise, by scientific methods'. The Rationalist demand for proof or evidence before belief can never be met. Like all such positions, it refutes itself, for it itself is held without proof or evidence, and any alleged proof or evidence would itself have to be proved to be proof or have evidence that it was evidence (i.e. both valid and relevant), which in turn would require two further sets of proof or evidence (for its validity and relevance), and so on *ad infinitum* to ever-branching powers of two. Popper had to acknowledge that his critical rationalism was, in its own terms, irrationally held (*The Open Society*, I, pp.230-1).

It seems that we are left, as many proclaim today, with Relativism. We have our perspective, world-view, fundamental beliefs, and others have theirs, and there neither is nor can be any rational choice between them for there are no universal and context-free principles to which we can appeal. Our standards are only *our* standards, and, if we think that we do have universal principles, then we unwarrantedly universalising our own, limited, temporal and provincial

ones. We can either continue vainly and imperialistically to hanker after universal principles, which would critically establish the one valid set of fundamental beliefs, the one adequate language, the one all-embracing perspective or route to a view above all perspectives, a 'view from nowhere'; or we can give up such futile yearnings and, with Nietzsche and his modern disciples such as Rorty, joyfully delight in our freedom from the constraints of value and truth. Despair or madness seem to be the only alternatives left to us.

In this paper, intended to introduce today's discussion of fundamental beliefs and presuppositions, I shall not directly propose a way out of that dilemma. Instead, I shall examine what it is to presuppose something, and sketch the role that fundamental presuppositions play in life and thought. Once we grasp this, I think, our situation will not seem so desperate.

2 Presupposing and presuppositions defined

What is it to presuppose something? The one philosopher to attempt a detailed answer was R.G. Collingwood. Collingwood's account was based on his *Logic of Question and Answer*, only briefly sketched in his *Autobiography* and the *Essay on Metaphysics*, according to which statements have meaning and are true or false only as answers to questions. I think that quite a lot can be said for that account, but shall not go to it here. What matters for us is that Collingwood regards presuppositions as the presuppositions of questions, and each question has only one presupposition from which it immediately arises. Thus, 'Why did that line break?' presupposes that the line has broken. He divides presuppositions into two dichotomous classes, relative and absolute. A relative one stands to one question as its presupposition and to another as its answer. In contrast,

an absolute presupposition is never an answer to any question. Science (i.e. any body of organised knowledge) deals with relative presuppositions, but metaphysics picks up absolute ones. Yet it does not ask whether they are true or not, still less does it seek to justify them, but only to discover whether they have been presupposed, or, rather, what have been the presuppositions of a science at a given phase of its history. Metaphysics is therefore an historical study.

This account poses certain difficulties.

Firstly, Collingwood's claim that absolute presuppositions are neither true nor false because they are not answers to questions: they are simply presupposed. Collingwood argues that the logical efficacy of any presupposition depends upon its being supposed, not on its truth or falsity, nor even on its being thought to be true. In a sense that is true, as when we make assumptions which we do not know to be true in order to infer their consequences and thus to see if they are true or false, or, when believing them to be false, to infer their manifestly false consequences in order to prove that they are false. But when we suppose that X is Y, we suppose that it is *true* that X is Y, even though we may believe it to be false. Likewise we presuppose that X is Y is true, that the line *has* broken when asking why it has broken. So too with absolute presuppositions. To use some illustrations from *EM* Chap. VI, Newtonian physics absolutely presupposed that some events *have* causes, 'Kantian' physics that all *have* causes, and Einsteinian science that none *have* causes. Collingwood, chiding Positivists (but not Russell) with clinging to Kantian physics, clearly implies that they mistakenly think that all events have causes and that it is *false* that all, indeed any, events have causes. Presupposing is presupposing to be true or false.

Secondly, as Krausz pointed out (in his own contribution to *Critical*

Essays on the Philosophy of R.G. Collingwood, ed. Krausz, OUP 1972) some absolute presuppositions presuppose others: e.g. the Conservation of Matter presupposes the existence of matter. It is not so clear that a sharp division can be made between absolute and relative ones, and I would suggest that we need to distinguish sub-species of them at different levels of generality: for example, those of a science at a given phase, as in the example already cited; those of a science itself, which distinguish it from other sciences and from the non-science from which it has emerged; and those of any coherent thought whatsoever.

Let us start again, without particular reference to questions and answers. I wish to distinguish among supposing, assuming and presupposing.

1. 'Suppose' suggests explicit rather than implicit acts, and therefore voluntary ones: we use it especially when inviting someone to make an assumption or when stating our own.

2. 'Assume' is used in the same way as 'suppose' but it is also used, and more frequently than is 'suppose', to refer to implicit and involuntary acts, in which we are not aware of the assumptions we are making. That is, it then refers to what is *implied* by what we do, think or say, rather than to what we are aware of and intend to do, or think or say.

3. In contrast, although both 'suppose' and especially 'assume' are used to apply to the following, I propose to use the less common term, 'presuppose', to refer only to what we tacitly do, *at the moment of doing it*, when we act, think or speak. In that way presupposing is involuntary: we can choose to do or not to do X which presupposes Y, but we cannot directly to choose to presuppose Y. What we can do is to choose to perform or not perform acts which we think to presuppose Y.

The logical relation common to all three terms is one of 'backwards

implication', of what must be the case if X is true or possible. Presuppositions are logical antecedents, whereas implications or entailments are logical consequences. Kant's principle, that 'ought' implies 'can', is really one of presupposition: if I *ought* to do X, then whatever condition, V, would make my performance of X possible, is therefore presupposed to be the case, otherwise the question of whether I ought to do X or not, does not arise.

Presuppositions, therefore, are what we tacitly assume to be the case or to be possible (or the reverse) when we engage in a specific activity upon a particular occasion. Jumping out of the frying-pan, I presuppose that anywhere else, including the fire, is less painful. Running onto a wooden bridge across a chasm, I presuppose that it will bear my weight. Standing on the edge while I test it with my foot, I presuppose that the edge is firm and that my tapping of the deck of the bridge with my foot will give me some clue as to its capacity to bear my weight.

We have thus broadened the scope of presuppositions: they are those of any and all types of action and activity, and not just those of the asking of questions.

We can see now that we make, and cannot but make presuppositions, because we live, think and act in situations and circumstances and with and upon materials. Everything we intend to do, makes some presuppositions about what the current situation or set of circumstances is or is not, and what it can or cannot lead to. Only God, who is above all situations and circumstances, is free from presuppositions.

We can now also offer a re-definition of absolute presuppositions: they are those which we cannot but make in any form of action in any and all circumstances or situations. And below them we can define sets of less relative or more general presuppositions which

apply to whole types of activity and situation, such as, as suggested above, those of a specific science at a particular phase in its history, of that science in all its phases, of any science or disciplined form of investigation and organised body of knowledge arising from it.

It also follows that presuppositions are not a sub-class of something else, alongside fundamental beliefs, first principles, categories, axioms, frameworks, schemata, paradigms, or whatever other high-level and controlling principles which can be discerned in our living, thinking and acting. Rather, all such principles as we use to organise thought and action are themselves presupposed to be true, valid or appropriate to our thought and action in the world.

3 Philosophy and presuppositions

Philosophy, I suggest, is the study of absolute and more general presuppositions. That means, as Collingwood said, it is a historical study. Now at this point, Collingwood has often been misunderstood, partly because of his own denial that absolute presuppositions are true or false, but mostly because his critics have an idea of history that is fixated at the level of 'chronicle'—the retelling of mostly distinct events, recorded from the outside—and which has not yet risen to what I would call 'history proper' in parallel to Collingwood's own use of 'art proper', i.e. history as *re-enactment* and thus, as Collingwood rightly insisted, *critical* re-enactment. For the historian re-enacts what he is studying, not only in its own context, but also in his own: e.g. in studying the economic life and policies of a previous age, he not uses the economic ideas of the time, but his own, and today that means modern economics, so that he can and should be able to see more, e.g. inflation, in the past situation than those who lived and acted in it did, and to see

more correctly those features that they did see, and thus to grasp how and why their policies succeeded or failed. A genuine history of science likewise imaginatively rethinks the thoughts of scientists: it apprehends what they knew, the problems they faced, the likely solutions and procedures that were to hand, the conjectures that they made, the experiments they performed, and the results they obtained; and it does so also in the light of current knowledge which accredits their discoveries and explains their failures and errors. It is in the laboratory, working with the scientist, and not outside looking in and looking at.

Polanyi, especially in *The Study of Man*, in effect generalised Collingwood's 're-enactment' as 'indwelling' to cover all apprehension of human action, and of animal activity, whereby we attend from its subsidiary details, as does the agent himself, to their meaning, i.e. the action itself, its governing intention and the agent's grasp of the situation in which he is acting. Any detached observation, as professed by Behaviourism, cannot work, for it must destroy the latter in attempting to focus upon the former, and in fact it tacitly supplements and interprets the former by reference to the latter. I saw a cat looking intently up a tree in the garden; I followed its gaze, looking myself *from* the cat and *to* the branches of the tree, and saw the squirrel trapped up there; I thus indwelt or re-enacted the cat's direction of its attention and its desire to catch the squirrel. Detached observation of the cat as a physical object, would have ignored the tree and never seen the squirrel.

Now it seems to me that the charge of Relativism which Polanyi, Kuhn, Feyerabend and others have incurred in their accounts of the development and procedures of science, arise from *either* their own failure (but certainly not in the case of Polanyi) to re-enact, and thus critically to re-enact, the thinking

and procedures of scientists, which instead they have externally observed, or from a similar failure on the part of their critics: a third possibility is a failure on both sides. I shall return to this theme in a moment.

Another misunderstanding is that 'history' refers to the past *as distinct from the present*. But, insofar as there is continuity, we are studying *our own* presuppositions, and, as the past is more and more recent, so there will be more continuity than discontinuity.

And there is a second, and perfectly good sense of 'historical' which Collingwood himself invoked in *The New Leviathan*, of Locke's 'plain historical method', where one studies the patterns and structures of one's own thinking as an instance of the human mind generally, or, specifically, that of the modern European mind. For whether one's own thinking and action or another's, whether as present or as encapsulated in the present, one begins with empirical fact, what *is* or *has been* thought and said and done. (Hence Collingwood's perfectly valid identification of history, which is philosophical in being *critical* re-enactment, and philosophy, which is historical in starting from historical fact.) Here again, what is needed is critical re-thinking of one's own thoughts. Hume's scepticism arose, certainly in part, from his attempt merely to observe the workings of his own mind, and so its logic escaped him.

But one thing Collingwood did get wrong: his claim that metaphysics (rather, philosophy in general) always has been a study of presuppositions. For it is quite clear that modern philosophy has largely been Critical, Justificatory or Foundational philosophy, which has taken its task to be, not just to find, but to assess, justify or 'found' our presuppositions, and thus, in the Hegelian sense, to 'overcome' them, to raise them from being acritically presupposed, or uncritically presupposed as those philoso-

phers would put it, to being *critically, rationally and justifiably* held. Moreover, insofar as pre-modern philosophers thought that they could formulate first principles axioms which were self-evidently, necessarily true, then they too were seeking something more than 'mere' presuppositions. (From what Dr Hick's says, was Thomas Reid at times trying to do that despite himself?)

Finally and explicitly to bring together the two sides that Collingwood set out somewhat separately in *Essay on Philosophical Method* and *Essay on Metaphysics* (but are to be found conjoined at the start of his career in *Religion and Philosophy* and at the end in *The New Leviathan*), philosophy is not simply history, which focuses upon what is unique and individual in the individual fact; for, in contrast, it seeks the universal and necessary in the individual fact from which it starts: that is, to find those absolute presuppositions (metaphysical, epistemological, axiological and moral) which are presupposed by all our thought and action, or those (again, metaphysical, epistemological, axiological and moral) which are presupposed in more specific types of activity, such as morality, practical life, science, historical thinking, or art.

4 The truth of presuppositions

Although Collingwood was wrong to isolate absolute presuppositions from truth and falsity, he rightly held that we cannot treat them as relative presuppositions, whose truth or falsity can be questioned and answered in the same way as those questions and answers of which they are the presuppositions. We seek to answer, 'Is that line broken?' in the same way as 'How did that line come to be broken?' For, if they are what, oxymoronically, I may call 'specifically', 'departmentally' or 'regionally' absolute presuppositions, i.e. those

which are presupposed by any performance of a specific activity or set of activities such as natural science, then they cannot be argued for in the same way as are propositions or procedures arising within that activity. If contiguity or the denial of action at a distance was a presupposition of pre-modern science, then no evidence from within pre-modern science could establish it or disprove it, precisely because it acted as a standard for what could count as scientific evidence. Again, if the conservation of matter and energy is a presupposition of any physics and natural science whatsoever, then it cannot be proved or refuted by any scientific procedure or experiments. For all such procedures and experiments are scientific only as presupposing those principles, and any putative evidence to the contrary is non-scientific and to be explained away as some sort of error, illusion or dirt-effect, or, from outside natural science altogether, as, in the strictly theological sense, a miracle.

It seems that we are therefore left with some sort of Humean scepticism, according to which this is just the way our minds work as a matter or habit or custom, or contemporary Relativism, according to which this is just the way our modern European science operates.

In part, as I have suggested, this view arises from the adoption of an attitude of detached observation. Indeed, it may be adopted and promoted, and I think that it often is, precisely in order to subvert the credibility of that which is supposedly being studied. The one thing that one needs strongly to suspect are the 'hermeneutics of suspicion' and the motives of those who promote it. In the case of Marxist or Marxist sociologists, they are easy to discern.

It also arises from the Rationalist Method of Doubt which, in turn, derives from the conviction that nothing should be believed without good reasons, evidence or proof, ultimately logically necessary proof, to be provided by a critical

or 'transcendental' philosophy which will examine and justify or 'found' our presuppositions and fundamental beliefs. Yet this way of conducting philosophy is one of Bad Faith. No critical or foundational philosopher lives, or could live, by his professed maxims. Descartes made that perfectly clear when he stated that, in the meantime, he would continue with his existing beliefs: an *Interimsethik*. While Hume, having come to moral scepticism in his study, locked away the results with the thought that they might not really be useful, and went off to forget them by playing blackgammon. Any critical or justificatory approach is corrupt from the outset.

What, then, should we do? The answer is simple: face the facts. And they are that faith precedes reason and knowledge, or, rather, as Collingwood said in the title of the essay, 'reason is faith cultivating itself'²: the whole life of man is *fides quaerens intellectum* (p.120). The critical approach inverts the natural and necessary order of things: it puts doubt before faith, knowledge before belief, and ultimate before proximate beliefs. What we are sure of is, for example, the current set of scientific theories and procedures and not any formulation of the premisses of science.

We do not believe in the existence of facts because of our anterior and securer belief in any explicit logical presuppositions of such a belief; but on the contrary, we believe in certain explicit presuppositions of factuality only because we have discovered that they are implied in our belief in the existence of facts (PK p. 162).

What we need to do is to recognise our own commitment to our proximate beliefs, for example, in everyday perception or in the current state of physics or historical research or surgery. (A critical philosopher makes no attempt to apply his philosophy when suffering from acute appendicitis.) *Gnōthē seauton* means *Gnōthē to*

hon pistōs. Our first task in philosophy is explicitly to acknowledge what we believe, and then we can proceed, as far as is possible, to trace what we thereby tacitly presuppose. The only possible 'justification' of the presuppositions of contemporary science (X, Y, Z) is that they are its presuppositions: i.e. that contemporary science employs such and such procedures and affirms such and such propositions and theories, and that in fact they presuppose X, Y, Z as what must be the case if the procedures are to be successful and the results of employing them true. And to establish that is, as Collingwood said, an historical task.

We thus establish that X, Y and Z are true by analysing those of our beliefs and practices which presuppose them. For example, to establish that there is no part of the human past which cannot, in principle, be known and understood and which matters in its own right simply because it is what some men somewhere have at some time done, one only has to reflect upon the practices of modern European historiography. Of course, if *you* not accept those practices, but, for example, hold with the Enlightenment (before Edmund Burke and Walter Scott) that nothing can really be known and understood before the dawning of Reason in the Renaissance, or have some Whig theory like those of Hegel and Marx that makes the past significant and intelligible only as a stepping-stone to the present and thence to the ultimate End *within* history, then you will not accept, in von Ranke's words, that 'every age is immediate to God . . . and has its meaning in itself'.

The proof of presuppositions lies in what presupposes them, and that is how we can argue for them. That was what Collingwood did in Part III of the *Essay on Metaphysics* wherein he showed, against the Positivists, that God exists and that there are no causes in nature, because the former is presupposed by modern science generally and

the latter by it in its present Einsteinian phase (with which the Positivists had not yet caught up). The argument for a presupposition is historical and analytic in form: if you accept believe M or practise N, then you implicitly hold that X or Y is true for they are what M and N presuppose. One can object in either or two ways: that M or N is not what one believes or performs, or that there is a fault in the analysis of M and N so that it can be seen to be the case that they do not in fact presuppose X and Y but something else.

Of course, what someone in fact believes and does, and thus what he presupposes to be true and significant, may not be what he says he believes and does. If so, he may be honestly or self-deceiving. Sensing that his belief in M or practice of N really does presuppose X or Y, and yet unwilling explicitly to profess belief in X or Y, he may flatly refuse to accept the analysis that shows that they do or pretend that really he doesn't believe in M or practise N. That is, he will give a distorted account of M or N, just as Collingwood argued that Positivists do of natural science in order to avoid metaphysics in general and theism in particular. If so, philosophy has been abandoned in favour of ideology and irrationalism.

In respect of absolute presuppositions, those of all our thought and action, a stronger argument from proximate beliefs and commitments is possible, the one that Polanyi gives in the middle sections of *Personal Knowledge*: viz. the 'back-handed' one of showing that any attempted proof or disproof of them must itself employ or presuppose them (e.g. the validity of induction, PK pp. 168, 305-6, 318, and, *passim*, the general reliability of our tacit powers of perception, judgment, comprehension and articulation).

Presuppositional philosophy is therefore in a sense always *ad hominem*: it poses the questions:

What do *I* or *you* really believe? i.e. to the truth of what do I or you

commit ourselves to in our actions? What does that in turn presuppose about the world, human knowledge and the duty of man? And will I or you explicitly acknowledge the tacit presuppositions of our beliefs?

It is necessarily a personal philosophy, addressed by persons to persons, whether themselves or others (see PK p. 299), and a 'post-critical' one (never having been 'critical', I would prefer 'non-critical', or better, the positive term 'fiduciary'—PK p. 318).

Its aim, in the current situation, still in all its Scepticism and Relativism fixated with the Critical and Justificatory demand, is to enable a *conversion*, a 'turning-round', from the wrong way back to the right, of the priority of belief over doubt, commitment over detachment, trust over suspicion: to 'believe what we might conceivably doubt; and . . . hold to be true what might conceivably be false' (PK p.312).

5 Dwelling in and breaking out

Curiously for an historian, Collingwood gave little attention to how constellations of absolute presuppositions emerge and change. He credits the mind with a power to create new ones but otherwise explains changes in terms of a shift of tensions within a constellation, whereby a recessive presupposition or sub-group becomes dominant, or vice-versa. That presupposes that they all already exist, and provides no clue as to how and why new ones are added and others dropped altogether.

This is also a problem posed by Relativism, with its claim that we are *confined* within our frameworks and perspectives which assimilate everything to them or blank it off. We can only dwell in them and never break out of them.

This, again, arises from acceptance of the Rationalist and Critical position, which presupposes that everything that can be known can be known explicitly, for, if it could not, it could not be criticised, assessed and justified or founded. Now if we could tell all that we know, the converse of Polanyi's dictum, '*We can know more than we can tell*' (TD p. 4), would follow: i.e. *we could not know what we could not tell*. This is the explicit teaching of Wittgenstein's *Tractatus*: what can be said can be said clearly; of what we cannot speak, we must remain silent, and cannot know; and 'the limits of my language are the limits of my world'. What my language will not allow be to say, that I cannot know. Outside of my vocabulary, I must be ignorant. Nor is there any essential difference between the *Tractatus* and the *Investigations*. Meaning is use and usage, not picturing, and use is more than use for stating facts. But, though more can be said, it can still be said clearly and what cannot is nescience.

One of the great differences between Wittgenstein and Polanyi lies here. For we would be the prisoners of language, however narrowly or broadly conceived, if we had no tacit powers of thought and if those tacit powers did not control our powers of articulation. It is precisely because we can know more than we can tell that, using Piaget's terms as did Polanyi, we can *adapt* our language and our frameworks to the world, as well as *assimilate* things in the world to them.

Once we accredit ourselves with this essentially tacit power, then we can see how we can create or adopt new presuppositions, even absolute ones, and discard old ones. I refer you to Piaget's *The Child's Conception of the World* for specific cases studies of how this is

done: e.g. the child's first drawing of the distinction between reality and unreality or mere appearance.

Our frameworks, perspectives, presuppositions, etc., are not self-enclosed. They essentially point beyond themselves to the world. Or rather, we tacitly direct ourselves with their aid to the world, and use them to apprehend the world and act within it. And thus, because we use them, we can create, modify and replace them.

So too with language. Living language is metaphor, the saying and thus coming explicitly to know what has not been said before and so has only inchoately and implicitly been known. Literal meaning, the touchstone of the usual run of philosophers, is its corpse, a set of metaphors so dead that we do not realise that they were ever alive. Language, as Collingwood taught, is Imagination, is Art. The myth of literal meaning is the consequence of the assumption that all knowing is explicit, and the consequence of both is that language could never have emerged in the first place nor be extended in the second. It is because I know something which as yet I cannot say, that I search for words to express it, and create new ones and use old ones in new meanings, and expect my audience to follow my gropings and tacitly to grasp the new meanings which I intend. Once more our task is to face the facts and accept them openly and with them what they presuppose.

Notes:

1. 1928, reprinted in ed. L. Rubinoff, *Faith and Reason: Essays in the Philosophy of Religion* by R.G. Collingwood (Chicago, Quadrangle Books, 1967).
2. 1927, reprinted in Rubinoff.

Chris Goodman

1 Introduction

Because symbols are the medium of abstract thought, language has always been important to philosophy. Socrates used language as the vehicle with which to progress towards an understanding of the reality which underlies our linguistic concepts. In the Middle Ages language became the focus of a debate between those who defended the claim that universals mirror the structure of reality, and those who claimed that objects have nothing more in common than our choosing to apply to them the same name. Relying upon the assumption that God ensures that a harmony exists between our reason and the world, Descartes suggested that just as there exists a definite order among our mathematical concepts, so it would be desirable to create an artificial language using symbols to designate our clear and distinct ideas. Although he retained the assumption that we ought to reform language by investigating the contents of our minds, Locke tried to comprehend our ideas psychologically. According to Locke words represent ideas in our mind, the origin of which can be traced back to our sensations. The assumption that the function of language is to represent has remained a familiar approach within the philosophy of language. Since Kant however there has been an alternative tradition which claims that it is our representations which render objects in the world possible. This idealist analysis influenced philosophers such as Herder, who although he grounded language within experience, transformed this claim by suggesting that our experience is structured by our reflection:

Man demonstrates reflection when the force of his soul works so freely in the ocean of sensations that flow

into it from all the senses, that he can, in a manner of speaking, isolate and stop one wave . . . He demonstrates reflection when emerging from the nebulous dream of images flitting past his senses, he can dwell voluntarily on one image . . . and distinguish characteristics . . . A characteristic which he had to isolate and which came to him clearly as a characteristic of reflection.¹

Language for Herder is a cultural practice which helps to structure our distinctively human understanding of the world.

Wilhelm von Humboldt suggested that it is futile to search for the reality underlying language, because linguistic diversity is not simply a diversity of sounds and signs but also a diversity of world views:

Men do not understand one another by relying on signs for things, nor by causing one another to produce exactly the same concepts, but by touching the same link in each others' spiritual instrument.²

Within this idealist approach language is important, not because we rely upon it to represent the world, but because language re-presents what counts as reality. We can make a broad distinction therefore between those for whom language is meaningful when it represents, and those for whom language is meaningful when it is associated with constitutive human practices. In the first approach philosophers seek to clarify language in order to enhance its effectiveness as a tool with which to represent the world. In the second language structures our understanding of the world. Within the Anglo-American philosophical tradition the most influential advocate for *both* these approaches has been Ludwig Wittgenstein. Instead of relying upon substantial forms or psychological

ideas Wittgenstein settles upon language as his ultimate context for our understanding of the world. In the *Tractatus* he asserts that we can grasp the sense of an unfamiliar proposition because linguistic understanding is a matter of understanding what would have to be the case if a proposition were true. What links a sentence and a possible fact is its logical form. We cannot describe logical form however because language cannot describe that which enables it to represent. How language is able to represent the world is thus ineffable. In his later writings he replaces his truth conditional account of linguistic meaning with the theory that words acquire their meaning not by representing an independent reality but by exercising their function within a local practice.

A major theme in his thought is his assumption that we can grasp more than we can say—including the conditions which enable language to become meaningful. His later thought can be understood as a development of his earlier claim that linguistic meaning is possible because of the existence of a context which can be shown but not stated. Some commentators have suggested that replacing logical conditions with local practices is a transformation which remains within the confines of transcendental idealism³. What is clear is that within the *Tractatus* linguistic meaning is associated with tacit rules, and in his later writings linguistic meaning is associated with tacit practices. Because Wittgenstein defends the assumption that we can know more than we can say, it is understandable why some commentators have sought to link Polanyi and Wittgenstein⁴. This however is a mistake. Wittgenstein tries to limit what can be meaningfully said—and thought: .

The book deals with the problems of philosophy, and shows I believe, that the reason why these problems are posed is that the logic of our language is misunderstood. The whole sense of the book might be summed up in the following words: what can be said at all can be said clearly, and what we cannot talk about we must pass over in silence.⁵

Wittgenstein does not seek to describe forms of judgement: he attempts to reveal the logical structure which underlies all meaningful propositions by showing rather than stating the boundaries of sense. The Kantian nature of this project however—i.e. the desire to identify *a priori* rules governing representation which both secure and limit possible understanding—is clear. In his later work Wittgenstein continues to be preoccupied by the quest to find a boundary which can both secure and limit possible understanding. In the *Philosophical Investigations* he asserts that we can escape the uncertainty which so often accompanies thinking by returning words back to familiar linguistic practices. Polanyi on the other hand does not believe that because our understanding relies upon a tacit context this implies that we ought to abandon the demands which are made upon us by our transcendent ideals. He does not believe that the limits of our language are the limits of our world. The difference between Wittgenstein and Polanyi however serves to illuminate the different assumptions which are being invoked when analytical philosophers use tacit knowledge as a solution to the problem of linguistic meaning. I intend therefore to investigate this difference in more detail.

2 Language in the *Tractatus*

In the *Tractatus* Wittgenstein claims that all philosophy is a critique of language, and its task ought to be the logical clarification of thought

Without philosophy, thoughts are, as it were, cloudy and indistinct. Its task is to make them clear. To give them sharp boundaries.⁶

He claims that only factual propositions are meaningful. Meaningful propositions are a picture of reality. If we want to understand a proposition therefore we have to know what has to be the case in order for it to be true. But how is it possible for a proposition to picture reality? He asserts that a picture represents a possible situation in logical space. The elements which make up a picture are related to each other in a determinate way. A picture is able to represent the world because things in the world are also related to each other in a determinate way. What a picture represents is its sense. The agreement or disagreement of its sense with reality constitutes its truth or falsity. The reason why logic can provide us with the scaffolding of all possible experience is that its truths exist prior to every possible experience:

Just as the only necessity which exists is a logical necessity, so the only impossibility which exists is a logical impossibility.⁷

But wait a minute! If it is only fact-stating language which has sense, what exactly is the status of his claims about the logical conditions which underlie the possibility of a link between language and the world? Wittgenstein asserts that logical truths, like ethical and aesthetic responses, cannot be *stated* they can only be *shown*. To understand the logic of our language is to render manifest the structures which render propositions meaningful by enabling them to mirror possible states of affairs. Wittgenstein, in short, claims that meaningful propositions become possible via our tacit adherence to logical rules which underlie the structure of our everyday language. By revealing this structure Wittgenstein believed that he had provided a definitive and unassailable account of how propositions become meaningful. In its own terms however

the *Tractatus* shows us something which cannot be put into words. It reveals truths which transcend the limits of language. Although the *Tractatus* makes a number of philosophical assumptions, such as transcendental solipsism and an atomistic ontology⁸, Wittgenstein denies that we can speak about such matters:

We feel that even when all possible scientific questions have been answered, the problems of life remain completely untouched. Of course there are no questions left, and this itself is the answer.⁹

Wittgenstein claims that once we understand that language is only meaningful when we restrict ourselves to factual statements, all other questions vanish, because neither the question nor any answer can be put into words. The logical conditions which enable a proposition to become meaningful prevent us from expressing anything which is higher:

How things are in the world is a matter of complete indifference for what is higher. God does not reveal himself in the world.¹⁰

This account is related to the Nominalist tradition in the late Middle Ages which did not believe that it is possible to rise up to that which is higher through our understanding of the world. William of Ockham, for example, believed that God as creator is absolutely transcendent. Many Nominalists advocated mysticism. According to Wittgenstein the mystical is not how things are in the world but that it exists

To view the world *sub specie aeterni* is to view it as a whole—a limited whole. Feeling the world as a limited whole—it is this that is mystical.¹¹

In his Introduction Russell claimed that we can avoid the mysticism of suggesting that the logical structure which determines propositional meaning can be shown but not stated by creating a language which can express the logical truths which underlie any possible object language.¹² It is clear however that the

rules of logic apply to all languages—including any language about logic—and so, if it is only fact-stating propositions which are to have sense, logical truths must be inexpressible.

3 *Language in the Philosophical Investigations*

There is an obvious contrast between an approach which grounds the possibility of meaning within logical rules, and an approach which places linguistic meaning within the context of local practices. One way of expressing this difference is in terms of atomism and holism. Within an atomistic semantics a word or sentence becomes meaningful when it mirrors a state of affairs in the world. Within a holistic semantics a word becomes meaningful within the context of a linguistic practice. In the *Philosophical Investigations* Wittgenstein declares that he has been forced to recognise some important errors in the account which he set out in the *Tractatus*¹³. While he maintains his conviction that philosophy is a critique of language, and that meaning relies upon a context which cannot be put into words; instead of claiming that philosophical confusion arises because we misunderstand the logic which underlies our evade language, he suggests that the 'bumps' which our understanding receives when it runs up against the 'limits of our language' can be avoided by placing language within the context of specific practices. Wittgenstein begins the *Investigations* by attacking the idea that words gain their meaning by being correlated with objects. Such a connection is supposed to take place via a process of ostensive definition i.e. indicating and object and then uttering its name. But for us to understand that an object is being named, we have to be already familiar with the practice of naming. Wittgenstein calls such practices 'language games'¹⁴ and declares that they

exist within what he calls 'forms of life'¹⁵. He observes that even in simple languages words function in numerous different ways.

Think of tools in a tool box; there is a hammer, pliers, a saw, a screw-driver, a rule, a gluepot, glue, nails and screws—The function of words are as diverse as the functions of these objects.¹⁶

Instead of seeking to reduce language into common logical forms, he thus advocates placing words within their local context.

Our language can be seen as ancient city: a maze of little streets and squares, of old and new houses, and of houses with additions from various periods; and this surrounded by a multitude of new boroughs with straight regular streets and uniform houses.¹⁷

Wittgenstein suggests that it only makes sense to identify something as a constituent part within a context. It does not for example make any sense to talk in absolute terms about the parts of a chair. All meaningful language relies upon a practice. Is it possible to describe linguistic practices using rules? Wittgenstein believes that attempting to capture human practices using rules is misguided. Using the example of a game, he points out that the practice which underlies what it is to be a game lacks any common property.

Don't say, 'There must be something in common, or they would not be called games'—but look and see whether there is anything in common to all—For if you look at them you will not see something that is common to all.¹⁸

To characterise such a network of similarities Wittgenstein uses the expression 'family resemblance'. Responding to the objection that using a word in an unregulated way makes it arbitrary, he noted that although we cannot define what it is to be a game,

It is not everywhere circumscribed by rules; but no more are there rules for

how high one throws the ball in tennis, or how hard; yet tennis is a game for all that and has rules too.¹⁹

But how is it possible to know something—such as what it is to be a game—and yet not be able to describe it? Wittgenstein claims that if you are surprised that it is possible to know something, and yet not be able to put it into words, this is because you are thinking of cases such as 'How many feet high is Mont Blanc?' rather than questions such as 'How is the word "game" used? or 'How does a clarinet sound?'. These latter cases cannot be captured by following a set of rules. Wittgenstein then asks us to imagine the possibility of a word whose application is everywhere bounded by rules. Does this not imply that we need rules in order to determine the application of rules?

But then how does an explanation help me understand, if after all it is not the final one? In that case the explanation is never completed; so I don't understand what he means, and never shall!—As though an explanation as it were hung in the air unless supported by another one.²⁰

According to Wittgenstein philosophy is a constant battle against the 'bewitchment of our intelligence' by language. This is a familiar refrain. Leibniz sought to reform language by appealing to our reason. Berkeley sought to avoid linguistic confusion by seeking to return us back to immediate experience. Wittgenstein however suggests that perplexity occurs when language 'goes on holiday' and strays away from the context from which we obtained its meaning

When philosophers use a word—'knowledge', 'being', 'object', 'I', 'proposition', 'name'—and try to grasp the essence of the thing, one must always ask oneself; is the word ever actually used in this way in the language game which is its original home?²¹

To know a word is to know how to

use it within a practice. Wittgenstein asks if this is the sort of thing an isolated individual could do just once in his life? He suggests that following a rule cannot be equivalent to believing that we are following a rule, because we could be mistaken. This implies that we cannot follow a rule privately. But what about words describing private sensations?

But doesn't what you say come to this: that there is no pain, for example, without pain behaviour? ²²

Although Wittgenstein denies that the word pain is a report of an inner state, he distances himself from behaviourism ²³. What he rejects is the assumption that the word 'pain' is meaningful by virtue of the fact that it represents a wholly private mental object. He suggests that the criteria for the meaningful use of the word 'pain' are bound up with linguistic practices. But what justifies such practices? Wittgenstein declares that the ultimate justification is a form of life

If I have exhausted the justification I have reached bedrock, and my spade is turned. Then I am inclined to say, this is simply what I do. ²⁴

4 Following rules

Both the atomistic representationalism outlined in the *Tractatus*, and the practice derived holism implied by the *Philosophical Investigations* rely upon a tacit context. In order to understand why this is the case it is helpful if we return back for a moment to developments within the history of philosophy. Since Parmenides metaphysics has tried to escape from the way the world subjectively appears to us and describe reality as it is in itself. The Realists believed that linguistic concepts can mirror the structure of the world. Nominalists however believed that language is simply a way of ordering our experience. In his 'Copernican Revolution' Kant set out to fuse the rationalistic assumption that our reflection de-

livers knowledge, with the empiricist assumption that knowledge arises from experience, by claiming that philosophers can describe the structures which render our experience possible. In a related manner the *Tractatus* and the *Philosophical Investigations* claim to have identified the structures which render linguistic meaning possible. If however the quest to describe reality as it is in itself is abandoned, this raises the question of how it is possible for a philosopher to obtain an insight into the objective context of our understanding? By asserting that we can know but not describe the framework which renders our linguistic meaning possible, Wittgenstein offers us a solution to this problem. His appeal to the tacit however carries with it the implication that we ought simply to accept the context which render our language possible.

In holding that there are certain principles implicit in what we ordinarily say and do that can be elucidated by philosophical investigation, Wittgenstein puts himself in a philosophical tradition that goes back to the Platonic doctrine of recollection. But unlike Plato, who thought of learning as a matter of remembering doctrines learned in a past life, Wittgenstein holds that philosophy consists in reminding ourselves of the rules of language, rules we ordinarily follow without thinking about them. ²⁵

In recent years the attempt by Wittgenstein to shift the tacit background of linguistic meaning from a logical to a social context has been discussed in what has become known as the 'Rule Following' debate.

In *Wittgenstein on Rules and Private Language* ²⁶ Kripke suggests that Wittgenstein believes that there is no such thing as a fact which can determine a meaning. In the case of $68 + 57$ the sceptic could always doubt whether any previous instruction could compel the answer 125 rather than 5. Perhaps when I used the term 'plus' in the past, I always meant by this 'quus' i.e. the 'bent' rule that when

we add two numbers together if one is greater than 57 the sum is always 5

This then is the sceptical paradox. When I respond in one way rather than another to such a problem as $68 + 57$ I can have no justification for one response rather than another. Since the sceptic whosupposes that I meant quus cannot be answered, there is no fact about me that distinguishes between my meaning plus and my meaning quus. ²⁷

According to Kripke the solution which Wittgenstein gives to this 'sceptical paradox' is that the only meaning norm we can have is the rule following of a community.

A deviant individual whose responses do not accord with those of the community in enough cases will not be judged, by the community, to be following its rules. ²⁸

It seems clear that Wittgenstein in his later work did seek to deny that there are explicit rules which can give words a determinate sense.

A rule stands there like a signpost. Does the signpost leave no doubt open about the way I have to go?..where is it said which way I am to follow; whether in the direction of its finger or (e.g.) in the opposite one? ²⁹

It also seems clear that Wittgenstein sought to deny that there are occurrent mental states which can give words a determinate sense.

When I think in language, there aren't 'meanings' going through my mind in addition to the verbal expressions: the language is itself the vehicle of thought. ³⁰

It is questionable, however, whether Wittgenstein sought to doubt the existence of an objective context for linguistic meaning. According to Wright the *Philosophical Investigations* does not discuss the objectivity of rules

Wittgenstein is preoccupied with the sense, if any, in which a rule is genuinely an object of intellection, something whose requirements we track—to use a more recent piece of

jargon—by grace of some intuitive or interpretative power. Undoubtedly the intention—or one might better say, the suspicion—of these passages is negative. Wittgenstein thinks we badly misunderstand what the accomplishment is of someone who is a competent rule follower, and our misunderstanding leads us to over dignify the nature of the constraint imposed by a rule, and the character of our accomplishment in following it. But there is, emphatically, no explicit denial of the existence of the constraint, and no consequential rejection of the very notion of accomplishment.’ 31.

According to this interpretation, Wittgenstein did not question the existence of objective standards of correctness, he questioned the extent to which meaning is something about which it is possible to give a formal account. This reading is supported by the fact that Wittgenstein follows his assertion that every course of action could be made to accord with a rule, by claiming that

What this shows is that there is a way of grasping a rule which is not an interpretation, but which is exhibited in what we call ‘obeying a rule’ and ‘going against it’ in specific cases.³²

In other words Wittgenstein avoids a potentially infinite regress of interpretations by grounding the distinction between correct and seems correct in local practices ‘When I obey a rule, I do not chose. I obey a rule blindly.’³³

The ‘sceptical paradox’ is avoided by placing rule following within the context of tacit but ordered practices.

5 Tacit knowing in analytic philosophy

The other key feature of the ‘Rule Following’ debate is what has been called the ‘Private Language Argument’. This centres upon the question of whether the context within which rule following takes place has to be social. Could a Robinson Crusoe isolated since birth on a

tropical island establish a linguistic practice? It is often asserted that the ‘Private Language Argument’ seeks to deny this possibility. The claim that a private language has no independent criteria for assessing if a word has been used correctly, and thus it cannot be a language, is however not equivalent to a denial that an isolated individual can secure meanings grounded within an ordered practice. To satisfy the demands made by the ‘Private Language Argument’ all we have to ensure is that the meanings generated by our isolated individual are grounded within practices with an interest in distinguishing between correct and seems correct. This is not difficult. If Robinson Crusoe goes to his store marked with his symbol for nuts, and discovers that it contains fish, he becomes aware of an error. The ‘Private Language Argument’ does not seek to deny that an individual could establish a language, only that an individual could establish a language which cannot in principle be shared. It forms part of his replacement of the logical solipsism of his earlier work with the practice derived holism of his later writings. But where does the assertion that we can dissolve linguistic meaning into local practices leave the analytical quest to provide a formal theory of meaning? In order to recover the ideal that a formal theory of meaning is possible, some philosophers have sought to account for our ability to recognise novel sentences by claiming that semantic rules are hardwired into human brain functioning. Evans construes the claim that we tacitly know meaning delivering axioms as ascribing to a language user observable dispositions—one corresponding to each of the expressions derivable from a set of meaning delivering axioms³⁴. According to Evans, understanding tacit knowledge in this way enables us to make empirically verifiable claims about the causal structure of specific language users.

The suggestion that there is an isomorphism between the grammar

and semantics of natural languages, and causal structures within actual speakers, has been defended more recently by Davies.

The basic idea is that tacit knowledge of a particular systematic theory is constituted by a causal explanatory structure in the speaker which mirrors the derivational structure in the theory. Where there is, in the theory, a common factor—for example, a common axiom—used in the derivation of several theorems, there should be, in the speaker, a causal common factor implicated in the explanations of the several corresponding pieces of knowledge about whole sentences.³⁵

The most influential defence of the claim that natural language speakers derive their linguistic competence from an innate but tacit understanding of its rules—rendering all natural languages susceptible to a formal analysis—is provided by Chomsky. According to Chomsky, knowing a language is not a skill.

Rather, we take bicycle riding to be a skill, whereas knowledge of a language . . . is not a skill at all.³⁶

It is a competence. To counter the objection that a competence does not count as knowledge unless it is also a justified belief, Chomsky suggests a new term ‘cognise’

Cognising is tacit or implicit knowledge . . . [it] . . . has the structure and character of knowledge, but may be, and in interesting cases is, inaccessible to consciousness.³⁷

According to Dennett, what Chomsky calls tacit knowledge is a species of explicit representation which cannot be built into language machines without it first being explicitly represented³⁸. Davies responds however that tacit knowledge does not have to be explicitly represented, it can be realised by a processor³⁹. It is simply a causal systematicity within the internal functioning of a processor which mirrors the systematicity of a tacitly known theory. He points out that one of the characteristic features of the connectionist programme in artificial intelligence research has been the complete

absence of a syntactic level of description.

Wittgenstein, however, seeks to disassociate himself from the claim that recognising a meaning is an unconscious psychological mechanism.

If one says that knowing the ABC is a state of mind, one is thinking of a state of a mental apparatus (perhaps of the brain) by means of which we explain the manifestations of that knowledge. Such a state is called a disposition. But there are objections to speaking of a state of mind here, inasmuch as there ought to be two different criteria for such a state: a knowledge of the construction of the apparatus, quite apart from what it does. (Nothing would be more confusing here to use the words 'conscious' and 'unconscious' for the contrast between states of consciousness and dispositions. For this pair of terms covers up a grammatical difference.)⁴⁰

According to Wittgenstein, dispositional explanations ignore the normative character of rules and therefore obscure the difference between 'being causally determined and being logically determined'⁴¹. Instead of explicating meaning in terms of causes, Wittgenstein places language within the context of normative practices. In Part II of the *Investigations* he develops this theme using the phenomena of changing aspects.

I contemplate a face, and then suddenly notice its likeness to another. I see that it has not changed; and yet I see it differently. I call this experience 'noticing an aspect'⁴².

In the case of drawing of a triangle it is possible to see it as a geometrical drawing, as a symbol of a mountain, or as an arrow. According to Wittgenstein, at the root of these changes in perception is mastery of a technique.

It is only if someone can do, has learnt, is master of, such-and-such, that it makes sense to say he has had this experience⁴³.

He implies therefore that our experience of the world is bound up

with norms associated with local practices. If we seek to understand linguistic meaning we have therefore to adopt a form of life. In his final work *On Certainty*⁴⁴ Wittgenstein returns to his theme that our assertions rely upon the tacit context of a practice before they can have a meaning

I did not get my picture of the world by satisfying myself of its correctness; nor do I have it because I am satisfied of its correctness. No, it is the inherited background against which I distinguish between true and false.⁴⁵

Wittgenstein asserts that doubt is only possible against an inherited background of existing practices. Doubting only makes sense within a context which is not itself a subject for doubt: 'The game of doubting itself presupposes certainty.'⁴⁶ The context within which doubt is possible however is not fixed. Wittgenstein compares it with the bed of a river. The human 'stream of life' takes place within a river whose banks are ever changing practices

Am I not getting closer and closer to saying that in the end logic cannot be described? You must look at the practice of language, then you will see it.⁴⁷

But what happens when different practices, such as science, and a belief in oracles, come into conflict? He asserts that the advocates of each practice may well call their opponents fools and heretics. But does this mean that conversions from one way of thinking to another way of thinking are impossible? Wittgenstein denies this.

At the end of reasons comes persuasion. Think of what happens when missionaries convert natives.⁴⁸

But to what does a missionary appeal when he is attempting to persuade? By seeking to return meaning back to the uses embodied within familiar practices, we undermine any motive for changing existing practices.

6 Universal rules or local practices? Polanyi's answer

If you seek to defend the assumption that linguistic meaning is rendered possible by our tacit knowledge analytical philosophers will therefore direct you to one of two positions:

1. Meaning is secured by universal rules which, although not explicitly known, govern our ability to recognise new sentences.
2. Meaning is not governed by any universal rules but is grounded within contingent local practices.

Which position does Polanyi support? Neither. The assumption that we can discover rules which will enable us to comprehend what is meant by all possible words and sentences is a linguistic version of the philosophically dubious quest to secure an absolute foundation for all possible understanding. The claim that such an understanding is possible because all languages are governed by rules hardwired into our brain is hardly more persuasive. When in 1968 Polanyi was asked to comment upon the approach to linguistics being developed by Chomsky he responded that it fails to provide us with any real ability to talk about meaning⁴⁹. According to Polanyi meaning is a triadic relation between subsidiary particulars, a focal entity, and a knower. Only an agent who can attend from a subsidiary to a focal awareness can bestow a meaning upon a symbol.

This is why meaning cannot be introduced by a computer, because computers can only operate with focally known elements. It can never reproduce two different levels of awareness.⁵⁰

Chomsky believes that our knowledge of linguistic rules and their application within our speech is unconscious. Polanyi however responds that such knowledge is subsidiary and its application a tacit integration:

The difference is essential. To say that we are subsidiarily aware of a

thing or action is to attribute to it a particular function, namely a bearing on its meaning, which is at the focus of our attention. The level of consciousness at which we are aware of a subsidiary particular may vary over the whole range of possible levels.⁵¹

In order to understand how it is possible for an infant to know a complex set of linguistic rules, intelligible as such by only a few experts, Polanyi uses as an example the way in which we learn how to keep our balance when riding a bicycle. When learning to ride a bicycle our attention is focused upon the task of keeping our balance, which we eventually achieve by subsidiarily evoking the knowledge which secures our equilibrium. Simply knowing a set of rules is not equivalent to being able to ride a bicycle. In order to understand how we can understand novel sentences Polanyi credits our imagination with the capacity to extend familiar practices into unfamiliar contexts. For example a cyclist who has learned how to ride using only flat roads will have to re-apply his knowledge when confronted with the problem of a steep hill. According to Polanyi what drives vocabulary growth, and the acquisition of ever more complex grammatical rules, is the imaginative quest for ever greater communicative precision.

The manifest parallelism of this conception to the heuristics of science and technology is clear. To apply it more closely, we may note that pure science discovering meaning in nature is a pursuit of sense-reading, while technical invention which makes things into instruments for a set purpose is a sense-giving.⁵²

For Polanyi linguistic achievement is similar to a sequence of advances in a basic problem within science or technology. Within both there is a heuristic tension between our imagination and our tacit intuition. The claim that linguistic meanings are only grounded within local practices, although it avoids the ambitious but dubious aspiration of

discovering rules which enable us to comprehend the meaning of all possible words and sentences, fails to avoid the charge of linguistic relativism. Rejecting the notion that acquiring a practice implies the termination of any further reflection, Polanyi believes that symbolic articulation enables us to reflect critically upon our practices. Abandoning the quest to find a transcendent viewpoint does not imply that ought to abandon the pursuit of universal ideals. It simply places this quest within a human context.

7 Polanyi on meaning and formalisation

Both Wittgenstein and Polanyi ground meaning within a tacit context. Polanyi, however, supports a different conception of meaning. Let us examine his account in more detail. Our intellectual superiority over other animals, he asserts, can be almost entirely derived from our capacity for language⁵³. This capacity requires the ability to contrive symbols, observe their fitness, and interpret unfamiliar arrangements. These abilities he postulates rely upon three types of animal intelligence:

Type A: Trick Learning—Contriving a useful effect e.g. pressing a lever to escape;

Type B: Sign Learning—Recognising a sign e.g. that a green light indicates food;

Type C: Latent Learning—Interpreting a situation e.g. finding your way around a maze.

While many animals possess these abilities, Polanyi claims that only man is able to combine them effectively. This relatively small advance in our inarticulate capacities powerfully enhances the unformalised intelligence we share with other animals. Our utterances, however, not only rely upon our animal intelligence, but they also rely upon the articulate framework we acquire during our cultural education; indeed our inarticulate abilities keep on growing in the very exercise of

our articulate powers.

Our formal upbringing evokes in us an elaborate set of emotional responses, operating within an articulate cultural framework. By the strength of these affections we assimilate this framework and uphold it as our culture.⁵⁴

When a child learns a language it adopts an interpretation of the universe rooted in the idiom of the group into which it was born

Different vocabularies for the interpretation of things divide men into groups which cannot understand each other's way of seeing things and of acting upon them. For different idioms determine different patterns of possible emotions and action.⁵⁵

Polanyi asserts that all languages—by which he means all symbolic articulations—have two key operational principles:

1. **The Law of Poverty**—To be manageable languages must be finite enough to allow the same words to be used a number of times.
2. **The Law of Grammar**—To enable our languages to cope with complexity our words must be ordered by grammatical rules.

A language enhances our native intellectual powers only to the extent to which it facilitates the contemplation of that which it seeks to denote. While it may be the case that a map becomes more accurate the nearer its scale approaches unity, if it were to approach unity it would become useless. The Laws of Poverty and Grammar both refer to words, but words cannot function as words unless they are distinctive and used consistently. Polanyi therefore adds two further principles:

3. **The Law of Iteration.**
4. **The Law of Consistency.**

The distinctiveness of a word is bound up with it possessing an identifiable form. Since the world never repeats itself exactly, consistency can only be reached by identifying common features in different situations, which in turn requires us

to make personal judgements.

First, we must decide what variations of our experience are irrelevant to the identification of this recurrent feature, as forming no part of it i.e. we must discriminate against its random background. Secondly, we must decide what variations should be accepted as normal changes in the appearance of this identifiable feature, or should be taken, on the contrary, to discredit this feature altogether as a recurrent element of experience.⁵⁶

These expectations generate a conceptual framework, upon which we rely when we interpret our experience.

According to Polanyi, the suggestion that language manipulates symbols in accordance with linguistic practices fails to acknowledge the part which ontological commitments play within our language.

The Laws of Poverty and Consistency imply that every time we use a word for denoting something, we perform and accredit our performance of an act of generalisation, and that correspondingly, the use of a word is taken to designate a class to which we attribute a substantial character. Moreover, by being prepared to speak in our language on future occasions, we anticipate its applicability to future experiences, which we expect to be identifiable in terms of the natural classes accredited by our language. These expectations form a theory of the universe, which we keep testing continuously as we go on talking about things. So long as we feel that our language classifies things well, we remain satisfied that it is right, and we continue to accept the theory of the universe implied in our language as true.⁵⁷

Polanyi implies that Wittgenstein defends an essentially nominalistic philosophy in which meaning is derived from grammatical conventions. It has been pointed out by Niquet however that 'language games' are not grammars—i.e. abstract sets of rules—they are ways of using language in the context of various 'forms of life'^{57a}. Daley also claims that Polanyi misunderstands Wittgenstein:

Wittgenstein's doctrine is the antith-

esis of conventionalism. Its whole purport is the same as Polanyi's, to prove that the restrictive theories of language and of meaning advanced by logicians of a positivist persuasion are inadequate to the facts of language as an ongoing activity.⁵⁸

It is not clear to me, however, that Wittgenstein does escape the charge that he defends—an admittedly practice based—nominalistic philosophy. In his anxiety to reject his earlier claim that language mirrors the structure of reality, he asserts that language is structured by our practices. But what motivates linguistic change? Wittgenstein seems to imply that such a question ought not concern us.

The great increase in our mental powers which derives from our acquisition of linguistic skills appears to conflict with the claim that knowing takes place by virtue of an art which is essentially inarticulate

The enormous increase in mental powers derived from the acquisition of formal instruments of thought stands in peculiar contrast with the facts collected in the first part of this book, which demonstrate the pervasive participation of the knowing person in the act of knowing by virtue of an art which is essentially inarticulate.⁵⁹

Polanyi brings these contradictory elements into harmony by noting that formalisation always remains incomplete.

We have seen that in all applications of a formalism to experience there is an indeterminacy involved, which must be resolved by the observer on the grounds of unspecifiable criteria. Now we may say further that the process of applying language to things is also necessarily unformalised; that is inarticulate. Denotation . . . is an art, and whatever we say about things assumes our endorsement of our skill in practising this art.⁶⁰

In order to illuminate the part which the tacit plays within articulation, Polanyi outlines three characteristic relations between thought and speech. In the first relation the

tacit predominates to such an extent that articulation is virtually impossible. Polanyi asserts that when assessors judge cotton quality their discernment cannot be captured using maxims, because they know more than they can tell. According to Polanyi, this is because their judgment relies upon a subsidiary awareness of particulars known instrumentally as clues within a practice. In the second relation the tacit is co-extensive with the symbols which carry the meaning e.g. when we read a letter our subsidiary awareness of the text is wholly conscious, although its meaning resides in our focal comprehension of the relevant particulars. In the third relation the tacit and the formal disengage, because we are no longer sure what we are talking about i.e. our symbols transcend our grasp of their meaning.

Polanyi asserts that when we learn a language we commit ourselves to a double indeterminacy. We are not only unable to say all we know, we also never quite know what is implied in what we say. Novel usage—for example irrational, negative, imaginary, and transfinite numbers—may initially be repudiated as meaningless, and yet eventually be adopted as meaningful. He does not believe, however, that such controversies are simply disputes about the use of words.

Grammar is precisely the total of linguistic rules which can be observed by using a language without attending to the things referred . . . The purpose of the philosophic pretence of being merely concerned with grammar is to contemplate and analyse reality, while denying the act of doing so.⁶¹

According to Polanyi, when we strive to solve a problem, we rely upon an interpretative framework. He makes a distinction however between assimilating a familiar procedure, and adapting an existing framework in order to comprise the lessons of a new experience. While the first is a routine performance, the second is a heuristic act:

A paradigm of the first is counting, which leaves its interpretative framework—the numbers used in counting—quite unchanged; the ideal of the second is found in . . . mathematical notations covering new conceptions. Ideally the first is strictly reversible, while the second is essentially irreversible. For to modify our idiom is to modify the frame of reference within which we shall henceforth interpret our experience; it is to modify ourselves.⁶²

The irreversible character of this heuristic feat suggests to him that if a solution is achieved by following definite rules it cannot be accredited as a discovery.

Even among mathematicians an argument which seems entirely convincing to one person may not even be comprehensible to another. Hence the striving to remove any occasion for the exercise of personal judgement by a strict formalisation of the deductive sciences; a striving which can now be seen to aim at defeating itself. For the meaning of a formalism lies in our subsidiary awareness of it within a conceptual focus sustained in terms of this formalism, and is necessarily absent therefore in operations carried out on symbols seen quite impersonally.⁶³

For Polanyi, the manner in which a mathematician works his way towards a discovery, shifting from intuition to computation, and from computation to intuition, represents in miniature the whole range of operations by which articulation both disciplines and expands our reasoning powers.

8 Language as tacit integrations

In his later article, 'Sense Giving and Sense Reading'⁶⁴, Polanyi claims that endowing our utterances [sense-giving] and the utterances of others [sense-reading] with a meaning has a characteristic pattern which he calls the structure of tacit knowing. He asserts that to form such a structure is to create meaning. When person A makes B stand for an object C this endows B with a meaning.

It is our subsidiary awareness of a thing that endows it with meaning: with a meaning that bears on an object of which we are focally aware. A meaningful relation of a subsidiary to a focal is formed by the action of a person who integrates one to the other, and the relation persists by the fact that the person keeps up this integration. We may say, in slightly more general terms, that the triad of tacit knowing consists in subsidiary things (B) bearing on a focus (C) by virtue of an integration performed by person (A); we may say also that in tacit knowing we attend from one or more subsidiaries to a focus on which the subsidiaries are brought to bear.⁶⁵

He gives various examples

1. In a skill various elements are integrated into a joint performance. These elements are subsidiaries within a focal act.
2. The different features which make up an expression bear upon the mood they jointly compose. We attend from different elements by integrating them into our impression of the mood which they express.
3. A chess player sees the chess pieces as they jointly bear upon his chances of winning the game. This is the meaning of the chess pieces to the player, as he decides from their position the choice of his next move.

According to Polanyi, in our transactions with the world we rely upon our body as an instrument. Such uses are skilful, and can be extended by using tools. When we endow internal and external clues with a meaning, our awareness of them is subsidiary. For example, the skilful use of a tool, and the recognition of a specimen by an expert, both rely upon a meaningful integration of a number of subsidiary elements. Polanyi suggests that this helps us to understand how meaningful utterances are rendered possible by vocal and grammatical skills we may not be able to describe.

To sum up, meaning arises either by integrating clues in our own body or by integrating clues outside, and all meaning known outside is due to our

subsidiary treatment of external things as we treat our body. We may be said to interiorize these things or to pour ourselves into them. It is by dwelling in them that we make them mean something on which we focus our attention.⁶⁶

When we point at and name an object its appearance is never quite the endpoint of our attention, because objects can be perceived under a variety of different conditions. The object could also be intangible e.g. a chess strategy. The less tangible the focus, the more purely mental is its object. This, he asserts, helps to resolve the conflict between the claim that denotative language bears on objects, and the claim that it bears upon conceptions. Both are correct—with a continuum between them. But how can one word represent various different items? In the *Critique of Pure Reason* Kant declares that subsuming particular instances under a general term

is a skill so deeply hidden in the human soul that we shall hardly guess the secret that nature employs.⁶⁷

Polanyi suggests however that this becomes a problem only if we are seeking an explicit procedure. Once we appreciate that particulars function as clues within a tacit integration, we can understand how it is that a variety of different encounters can bear subsidiarily upon a general conception.

Meaning is a problem for contemporary philosophers, according to Polanyi, for much the same reason that universals puzzled earlier philosophers. Because a word becomes meaningful within a tacit integration, if we seek to grasp its meaning in terms of an explicit procedure, this will shift our attention away from the context which gives a word its meaning. This will lead us to a semantic version of the 'Third Man' problem raised by Plato in the *Parmenides* i.e. how we can know what a meaning looks like independently of any specific instance.

Listen to the following formulation of

this attempt by Charles Morris. 'The sign vehicle itself is simply one object, and its denotation of other objects resides solely in the fact that here are rules of usage which correlate the two sets of objects'. This is to convert words into mere sounds and then to subject them to the operation of rules corresponding to the meanings they possessed before. But this does not work. Any rules that will operate on meaningless sounds endowing them with such powers as they would possess if they had a meaning will be found to include actions—like pointing at something—which introduce the very kind of meaningful integration which the operation was to eliminate.⁶⁸

Only an agent who can attend from a subsidiary awareness can bestow a meaning upon a symbol. Polanyi thus postulates the existence of two levels of awareness. Meaning takes place when an agent attends from a subsidiary to a focal awareness. A subsidiary awareness, however, is not the same as unconscious awareness.

When writing a letter I am fully aware of the pen and paper I am using. The fact that I am focusing my attention on these particulars, but attending from them to that which they mean, reduces them to a subsidiary status, but does not render my knowledge of them subconscious or preconscious, or such as one has of an indefinable Jamesian fringe.⁶⁹

It is function which makes an item subsidiary. Because we rely upon them when seeking to communicate our meanings linguistic rules are usually subsidiary.

9 Transnatural integrations

We live, according to Polanyi, in the meanings we are able to discern. Illusions however tell us that not everything is as it seems. We grasp something as 'real', Polanyi suggests, when we expect entities to manifest themselves in unexpected ways in the future. The meanings we discern in a work of art, however, do not seem to exist

in our absence

The meanings—the coherent entities—which we know as Michaelangelo's Moses, Beethoven's Ninth Symphony, the virtue of justice, and the Christian God are not only intangibles; they are regarded by contemporary men as free human creations—not subject to correction by nature.⁷⁰

In *Personal Knowledge* he defends the claim that all symbolic articulation relies upon our tacit knowledge. In 'Sense Giving and Sense Reading' he extends this into the claim that all meanings are particulars integrated into coherences. In his last published work *Meaning*, written in co-operation with Harry Prosch, he thus investigates what he calls trans-natural integrations. Polanyi begins by investigating the coherences known as metaphors. When we employ a name to designate something, words understood in this way function as indicators, pointing in a subsidiary way to the focal integration upon which they bear. The subsidiaries (S) bear upon (→) their focal meaning (F):

$S \rightarrow F$.

Within indication subsidiaries have no intrinsic interest: it is that upon which they bear which is the element which claims our intrinsic interest. This gives us a whole class of tacit knowing operations:

$-ii + ii$

$S \rightarrow F$.

Polanyi calls these integrations 'self-centred' integrations because they are made from the self as a centre (which includes all the subsidiary clues in which we dwell) to the object of our focal attention.

Polanyi then considers meanings in which subsidiary clues do not function simply as indicators pointing our way to something else. In this second kind of meaning it is the subsidiary clues that are of intrinsic interest

When we look at a country's flag on a solemn occasion, this otherwise meaningless piece of cloth becomes for us a moving spectacle, and to some people even a sacred object.⁷¹

With respect to intrinsic interest symbolisation can be described thus

$+ii -ii$

$S \rightarrow F$.

Whereas indication is 'self-centred', symbolisation is 'self-giving'. Within a self-centred integration subsidiaries bear upon a focal object. In a self-giving integration the self is carried away by the focal object.

The symbol, as an object of our focal awareness, is not merely established by an integration of subsidiary clues directed from the self to a focal object; it is also established by surrendering the diffuse memories and experiences of the self into this object, thus giving them a visible embodiment.⁷²

When a symbol embodying a significant matter has a significance of its own the result according to Polanyi is a metaphor. Within a metaphor both the tenor and vehicle have an intrinsic interest:

$t \quad v$

$+ ii + ii$

$S \rightarrow F$

Metaphors according to Polanyi, like all meanings, are established by integrating subsidiary particulars into comprehensive wholes. The distinctive feature of a metaphor is that it integrates seemingly incompatible elements into a novel meaning

The main difference between metaphor and indication is that metaphor is self-giving and not self-centred, and the subsidiary elements are of intrinsic interest. The main difference between metaphor and symbolisation is that in metaphorical meaning the focal element is intrinsically interesting. In other words, metaphor is self-giving and not self-centred, and its focal elements are of intrinsic interest.⁷³

Although metaphors call upon our imaginative powers to integrate incompatibles into a joint meaning, this in itself does not amount to a work of art. Within a work of art particulars are integrated within an artificial frame

This is how we can watch a murder in a play . . . without either jumping

up to rescue the victim, or feeling the action on the stage—the pretence of a murder—to be nonsensical. We accept the clues which the play offers to the imagination for sharing its meaning, and we live in this meaning rather than the meaning these events would have for us in our ordinary 'interested' lives. This is something of what Kant meant when he defined the aesthetic appreciation of art as a disinterested pleasure.⁷⁴

According to Polanyi the view, which he derives from Coleridge, that art requires a 'willing suspension of unbelief', is doubly misleading. A work of art comes into existence via an imaginative integration, and its reality is sustained by the imagination of those who seek to appreciate it. The acceptance of a work of art is not due to a suspension of disbelief but is rather an immersion in the belief that works of art are meaningful. Even the tendency within modernism—the aesthetic version of the moral inversion—to reduce our experience into meaningless fragments integrates incompatibles into novel orders. Polanyi suggests that the integration of incompatibles accomplished by the creative powers of the imagination is as evident in religious thought as it is in the arts. Religion however also seeks to give us a general meaning to our existence.

According to Hall by grasping religion in aesthetic terms, and neglecting the aesthetic character of science, Polanyi fails to do justice to religious experience.

There is a certain drift here that seems to head in the direction of the old positivistic assumptions concerning the relation of the sciences and the arts, assumptions Polanyi so wanted to defeat. Such positivistic assumptions include the assumption that the hypotheses of the sciences are empirically verifiable while art works are not subject to experiential tests, the assumption that the sciences are impersonal and objective while the arts are personal and subjective, and the assumption that the sciences assert facts based on observations while the arts involve values based on

acceptances.⁷⁵

Haddox declares that metaphors and symbols are not only 'attended to' but also 'attended from' when we inquire into reality.

Metaphors and symbols can be and are used to indicate aspects of the world. They are not simply art objects. Like science, art is created by the imagination through abstraction and is what it is by virtue of how it is used in personal action. Polanyi argues this in *Personal Knowledge*. He seems to forget it in *Meaning*.⁷⁶

Prosch points out however that Hall and Haddox have misunderstood the conception of art and religion set out in *Meaning*.⁷⁷ Polanyi consistently believed that reality provides us with an external pole in the natural sciences, mathematics, and art and religion, and he equally consistently made a distinction between the natural sciences, whose reality exists independently of our articulate systems, and practices such as mathematics, art, and religion, whose reality exists only within articulate systems. Both conceptions are consistent with his definition of reality as that from which we expect indeterminate properties to arise in the future.

The fact that the artist must labour to meet his self-set standards is sufficient warrant that he submits to these as being universal standards, not of his own arbitrary or wilful making. He may be the first ever to recognise them, yet he feels himself bound by them, not superior to them; for to him his innovation of standards appears to be a discovery, just as the innovative creation of a statistical understanding of nature appeared to modern physicists to be a discovery.⁷⁸

The assumption that to be real is to exist independently of our thought has led some commentators to misunderstand Polanyi as an orthodox Christian. Kennedy makes it clear however that:

Honesty demands that we acknowledge that Polanyi was not religiously committed nor did he have religious faith as this is understood in Christian theology . . . Religion for Polanyi is the highest reach of man's mental

existence, but it has no genuinely objective historical reference . . . It is rather an extension of the world of art, and its meaning does not go radically beyond the symbols and myths of ancient cultures.⁷⁹

Polanyi claims that someone who is prepared to inhabit a religious framework builds up their own universe.

God exists in the sense that He is to be obeyed, but not otherwise; not as a fact—any more than truth, beauty or justice exist as facts. All these, like God, are things which can only be appreciated by serving them.⁸⁰

It is questionable however whether any religion can survive the demise of its literal status. Prosch recalls trying to convince Polanyi

that no religion could be founded without its including somewhere in its lore the notion of its own real supernatural origin, and that the supernatural was therefore a necessary feature of any religion which became a 'going concern'. I was never able to succeed in getting him to admit this. He really had a difficult time understanding a belief in the factual reality of the religiously supernatural as anything much more than magic or superstition.⁸¹

The claim that *Meaning* neglects the role played by our imagination within the natural sciences is simply false. Polanyi merely observes that while a work of art is meaningless to us unless we exercise our imagination each time we experience it, the imaginative effort required for scientific discovery is gradually reduced as creative insights are transformed into everyday knowledge.

10 Conclusion

To conclude. Wittgenstein transfers from a representationalist to a constitutive account of language, while retaining the assumption that the task of philosophy is to distinguish between legitimate and illegitimate uses of language. Polanyi, on the other hand, links representationalist and constitutive elements into a

more general theory of meaning, which does not attempt to dissolve philosophical problems by appealing to legitimate and illegitimate uses of language. Both Wittgenstein and Polanyi defend the claim that **we know more than we can say**, but Polanyi does not, on the grounds of some supposed insight into the limits of our language, seek to legislate meaning, nor does he believe that the limits of our language are the limits of our world. Although Wittgenstein draws our attention to the phenomena of changing aspects, Polanyi uses perception shifts as evidence to support his claim that the imagination helps us to extend and deepen our understanding of the world.

Think of a medical student attending a course in the X-ray diagnosis of pulmonary disease. He watches in a darkened room shadowy traces on a fluorescent screen placed against a patient's chest, and hears the radiologist commenting to his assistants, in technical language, on the significant features of these shadows. At first the student is completely puzzled. For he can see in the X-ray pictures of a chest only the shadows of the heart and ribs, with a few spidery blotches between them. The experts seem to be romancing about figments of the imagination; he can see nothing that they are talking about. Then, as he goes on listening for a few weeks, looking carefully at every new picture of different cases, a tentative understanding will dawn on him; he will gradually forget about the ribs and

see the lungs. And eventually, if he perseveres intelligently, a rich panorama of significant details will be revealed to him: of physiological variations and pathological changes, of scars, of chronic infections and signs of actuate diseases.⁸²

His response to the perplexity which so often accompanies shifts in our perception is not to leave everything as it is, nor does he assume that we can discover some hidden knowledge which will help us to secure an absolute context for our understanding. Polanyi seeks rather to understand the tacit in functional terms, as that upon which we rely in our quest to discover and create meaning in the world and our lives.

Notes:

1. 'Über den Ursprung der Sprache' (1772) Quoted by Ernst Cassirer *The Philosophy of Symbolic Forms* Translated by Ralph Mannheim New Haven: Yale University Press (1955) Volume 1 p. 153.
See also Charles Taylor 'The Importance of Herder' in *Philosophical Arguments* Cambridge: Harvard University Press (1995) pp79-99.
2. Quoted by Cassirer *ibid* p.159.
See also *On Language* Translated by Peter Heath Cambridge: Cambridge University Press (1988).
3. See Bernard Williams 'Wittgenstein and Idealism' in *Moral Luck* Cambridge: Cambridge University Press (1981) and Adrian Moore 'Transcendental Idealism in Wittgenstein, and Theories of Meaning' *Philosophical Quarterly* 35 (1985).
- 4.. See C.B. Daly 'Polanyi and Wittgenstein' in *Intellect and Hope: Essays in the Thought of Michael Polanyi* Edited by Thomas Langford and William Pot-eat Durham: Duke University Press (1968) pp136-168; Marcel Niquet 'Wittgensteinian Lan-

- guage Games and Michael Polanyi's Conception of Knowledge' *Polanyiana* Volume 1-2 (1992) pp.63-83; and Robert Innis in *The Central Texts of Ludwig Wittgenstein* Oxford: Blackwell (1979) p.xiii-iv.
5. *Tractatus Logico-Philosophicus* Translated by D.F. Pears and B.F. McGinness London: Routledge p.3.
6. *Ibid* p.25.
7. *Ibid* p.71.
8. In a 1930 list of those who had exerted a major influence upon him Wittgenstein mentions Schopenhauer. In *The World as Will and Representation* Schopenhauer asserts that in an aesthetic experience the will is transcended and reality contemplated from the standpoint of eternity. He also claimed that 'the world is my representation' with the subject itself not represented. In the *Tractatus* Wittgenstein follows a similar line of thought:
'The subject does not belong to the world: rather it is the limit of the world. Where in the world is a metaphysical subject to be found? You will say this is

exactly like the case of the eye and the visual field. But really you do not see the eye.' *Ibid* p.57

As far as solipsism is concerned Wittgenstein notes:

'We cannot think what we cannot think; so what we cannot think we cannot say either. This remark provides the key to the problem, how much truth there is in solipsism. For what the solipsist means is quite correct, only it cannot be said, but makes itself manifest.' *Ibid* p.57.

Wittgenstein assumes an atomistic ontology because he seeks to explain how false but meaningful statements are possible.

'In outline, the Tractarian answer is that when one imagines something that does not exist, one does so not by imagining a non-existent object, but rather by imagining that certain simpler objects are arranged one way when they are actually arranged differently. In order to avoid an infinite regress, one is forced to conclude that there must be some simple terms that refer to things that exist.'

- P.S.Hacker *Insight and Illusion—Themes in the Philosophy of Wittgenstein* Oxford: Oxford University Press p.54.
9. *Tractatus* p.73.
 10. *Ibid* p.73.
 11. *Ibid* p.73.
 12. *Ibid* p.xxii.
 13. *Philosophical Investigations* Translated by G.E.M. Anscombe Oxford: Blackwell (1953) pviii.
 14. *Ibid* p. 5.
 15. *Ibid* p.11.
 16. *Ibid* p. 6.
 17. *Ibid* p. 8.
 18. *Ibid* p. 31.
 19. *Ibid* p. 33.
 20. *Ibid* p. 41.
 21. *Ibid* p. 48.
 22. *Ibid* p. 97.
 23. *Ibid* p. 102.
 24. *Ibid* p. 85.
 25. David G.Stern *Wittgenstein on Mind and Language* New York: Oxford University Press (1995) p. 17.
 26. *Wittgenstein on Rules and Private Language* Cambridge: Harvard University Press (1982).
 27. *Ibid* p. 2.
 28. *Ibid* p. 3.
 29. *Philosophical Investigations* p. 39.
 30. *Ibid* p. 7.
 31. Crispin Wright 'Wittgenstein's Rule Following Considerations and the Central Project of Theoretical Linguistics' in *Reflections on Chomsky* Edited by A.George Oxford: Blackwell p.239.
 32. *Philosophical Investigations* p.81.
 33. *Ibid* p.85.
 34. Gareth Evans 'Following a Rule: Objectivity and Meaning' in Wittgenstein: *To Follow A Rule* London: Routledge (1981) p.24.
 35. Martin Davies 'Connectionism, Modularity, and Tacit Knowledge' *British Journal of the Philosophy of Science* (1989) p.541.
 36. Noam Chomsky *Rules and Representations* Oxford: Blackwell (1980) p.102.
 37. *Ibid* pp69-70.
 38. Daniel Dennett 'Styles of Representation' pp.213-26.
 39. Davies *Ibid* pp.547-550.
 40. *Philosophical Investigations* p.58.
 41. *Ibid* p.220.
 42. *Ibid* p.193.
 43. *Ibid* p.209.
 44. *On Certainty* Edited by G.E.M. Anscombe and G.H. von Wright Translated by G.E.M. Anscombe and D. Paul Oxford : Blackwell (1969).
 45. *Ibid* p. 15.
 46. *Ibid* p.18.
 47. *Ibid* p.66.
 48. *Ibid* p.81.
 49. May Harrington Hall 'A Conversation with Michael Polanyi' *Psychology Today* 1:20-5 pp.65-7 (1968).
 50. *Ibid* p.67.
 51. 'Sense-Giving and Sense Reading' in *Knowing and Being: Essays* by Michael Polanyi (1969) Edited by M.Grene London: Routledge p197.
 52. *Ibid* p.205.
 53. *Personal Knowledge: Towards a Post-Critical Philosophy* London: Routledge (1958) p.69.
 54. *Ibid* p7.0.
 55. *Ibid* p.112.
 56. *Ibid* p.80.
 57. *Ibid* p.80.
 - 57a op. cit., p.73.
 58. Daley *Ibid* p.148.
 59. *Personal Knowledge* p.70
 60. *Ibid* p.60.
 61. *Ibid* p.114.
 62. *Ibid* p.105.
 63. *Ibid* p.119.
 64. 'Sense-Giving and Sense-Reading' See 51.
 65. *Ibid* 182.
 66. *Ibid* p183.
 67. *Critique Of Pure Reason* Translated by Norman Kemp-Smith London : Macmillan (1933) A141 B180 p.183.
 68. 'Sense-Giving and Sense-Reading' p.192.
 69. *Ibid* p.194.
 70. *Meaning* Chicago: Chicago University Press (1975) p.67.
 71. *Ibid* p.72.
 72. *Ibid* pp.74-5.
 73. Ronald Hall 'Michael Polanyi on Art and Religion: Some Critical Reflections on Meaning' *Zygon* (1982) 17 pp.9-18.
 74. *Meaning* p.87.
 75. Hall pp.14-15.
 76. Bruce Haddox 'Questioning Polanyi's Meaning: Response to Ronald Hall' *Zygon* (1982) 17 pp.19-24.
 77. Harry Prosch 'Polanyi's View of Religion in Personal Knowledge: A Response to Richard Gelwick' *Zygon* 17: p.41-48.
 78. *Meaning* p.103.
 79. Terence Kennedy 'The Morality of Knowledge' Rome: Pontifica Universitas Lateranensis (1979) pp138-40. Quoted by Prosch p.47.
 80. *Personal Knowledge* p.279.
 81. Prosch p.46.
 82. *Personal Knowledge* p.101.

MICHAEL POLANYI'S VISION OF THE MORAL FOUNDATIONS OF SCIENTIFIC REVOLUTIONS

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1 Introduction

The title of this paper is inspired by two sources. In the letter to the Philippians, St. Paul exhorts the members of the community to 'take on the mind' of Christ, who 'emptied himself' in order to enter into the human condition. John Henry Newman observed in his intellectual autobiography that 'The energy of the human intellect "does from opposition grow"; it thrives and is joyous, with a tough elastic strength, under the terrible blows of the divinely-fashioned weapon, and is never so much itself as when it has lately been overthrown' ([1864] 1967, 193). Although Newman was speaking of the impact of revelation on the mind of a believer, the image of the mind joyfully embracing its own conquest seems well-suited to the process of discovery as described by Michael Polanyi. In his understanding of scientific investigation, science is unquestionably at its best when it has 'lately been overthrown' by new insights into the nature of reality. In the moment of discovery, the mind empties itself of a formerly entrenched view and takes on a new pattern of operations.

The purpose of this essay is to discuss Polanyi's model of self-emptying knowledge. Where Thomas Kuhn portrays the process as a series of 'tradition-shattering' revolutions ([1962] 1970, 6) that can be treated as 'cumulative' only through a selective and distorting reading of the historical record (138, 181), Polanyi envisioned a stable frame of reference underlying all framework transformations in science: the metaphysical ideal of personal commitment to truth. From this 'unmoved mover' comes

the intellectual passions which demand that we empty ourselves of our prior commitments and make room for a new way of seeing reality. Using Polanyi's model of discovery allows for an appreciation of the continuity and development of science even through the most dramatic of conflicts; the constant ground of development is the conscience of science based on a personal commitment to truth.

2 Polanyi's credentials as an 'expert witness'

Because the fruitfulness of science depends on skills appropriate to each particular discipline, a scientist rarely—if ever—needs an adequate philosophy of science. Regardless of what theoretical framework the scientist has erected to interpret his or her own scientific activity, all such speculation is of a different kind, and secondary to, the scientific framework which yields empirical results. The philosophy of science is not and cannot be an object of scientific inquiry. There are no lab techniques capable of analysing 'science' scientifically; the tools used to investigate the charm of quarks, cannot be used to investigate the mind that constructed such concepts.

William Wallace points out that some scientists may suffer from a handicap when they attempt philosophy:

Truth, as I see it, is a property of knowledge, and concern with truth, as such, is a reflective concern that is usually not part of the scientist's mentality. Those who are unconvinced that there is such a thing as knowledge, or who are unable to see how new knowledge can be acquired, are in no position to address themselves to the problem of truth. And if this is so with truth, it is even more

so with the problem of certitude. Those who do not know, or who despair of ever being able to come to know, will never be in a position to know *that* they know and hence to be certain of their knowledge (1972-74, 2:323-4)¹.

Discussing the views of participants in a colloquium on scientific method, Wallace notes that

All were seemingly aware that scientists rarely advert to philosophical problems explicitly, and it was even noted that many scientists now have a 'disciplined disinterest' or even a 'trained incapacity' to deal with them (2:278).

If it is a mistake to assume that scientists are not automatically qualified to do philosophy, it is equally absurd to suppose that scientists know nothing about what science is; Wallace points to a lack of contact with science as the source of error in Mill's philosophy of science:

Whatever the intrinsic merits of Mill's classic, there can be no doubt that it soon became the standard textbook of logic in the universities and was almost universally looked upon, by the latter part of the nineteenth century, as the authoritative treatment of scientific methodology. Only recently, in fact, has the adequacy of Mill's treatment been called into question, and this on practically the same grounds as a criticism voiced by Whewell himself, namely, that Mill had no knowledge of science's history or of the actual practice of scientists, and thus created his method, as it were, in a logical vacuum (2:129).

Michael Polanyi merits attention and respect both as a scientist and as a philosopher of science. Although he was trained first in medicine, his primary scientific passion from 1917 until 1948 was for physical chemistry; he enjoyed

success in his work on the adsorption of gases, X-ray crystallography, and reaction kinetics. His interest in the philosophy of science dates to 1935, when he began to question 'the Soviet ideology under Stalin which denied justification to the pursuit of science' (TD p. 3). Polanyi's career from 1948 until his death in 1976 was primarily devoted to overturning a bad philosophy of science that is often espoused by good scientists.

In the exact sciences, this false ideal [of objectivism] is perhaps harmless, for it is in fact disregarded there by scientists. But we shall see that it exercises a destructive influence in biology, psychology, and sociology, and falsifies our whole outlook far beyond the domain of science (PK p. vii).

On the basis of his work in medicine and chemistry, Polanyi is qualified to testify about the process of scientific investigation; on the basis of his gift for philosophical reflection, he is qualified to explore the moral foundations of science and to testify against the 'false ideals' that arise from misinterpretations of science.

3 Building interpretative frameworks

Personal Knowledge is Polanyi's masterpiece on epistemology. In the Introduction, Polanyi notes that it is the result of nine years of research (PK p.ix). In this section and the next, we will focus on the linked notions of intellectual passions, interpretative frameworks, and commitment as they are described in *Personal Knowledge*. (All references in these two sections are to the corrected edition of 1962.)

In Chapter Six of *Personal Knowledge*, 'Intellectual Passions,' Polanyi turned our attention to the emotional subsidiaries of knowing. It is a cliché that 'people hear what they want to hear,' but for Polanyi the saying may be applied in a positive sense. In order to focus our attention on what really matters and

to spend time and energy assembling the material that will let us hear what reality is saying to us, we must be driven by a desire to understand and we must be sensitive to what happens in the process of investigation:

I want to show that scientific passions are no mere psychological by-product, but have a logical function which contributes an indispensable element to science. They respond to an essential quality in a scientific statement and may accordingly be said to be right or wrong, depending on whether we acknowledge or deny the presence of that quality in it The excitement of the scientist in making a discovery is an *intellectual* passion, telling that something is *intellectually* precious and, more particularly, that it is *precious to science*. And this affirmation forms part of science (PK pp.134-5).

In the actual conduct of science, it may not matter whether the scientists recognize the contributions of their own passions to their work, so long as they do in fact care enough about what they are doing in order to do it well. Good scientists with an inadequate philosophy of science can still be good scientists; two quite different kinds of skills and intellectual passions are demanded by scientific and philosophical research. The passions necessary for doing science do not stand at the focus of scientific inquiry, but sustain it from within the tacit dimension. Scientists may therefore rely on those specifically scientific subsidiaries without noticing or acknowledging that they exist.

Polanyi's notion of what constitutes an intellectual passion is related to his reflections on interpretative frameworks. Polanyi holds that all meaning depends on the tacit use of interpretative frameworks. These frameworks enable subsidiaries to bear upon a focus and invest it with significance that cannot be completely articulated. There is a vital circle between what we believe and what we feel. Our intellectual passions reflect our beliefs and at the same time have the power to change those commit-

ments so as to make them more satisfying. The conceptual frameworks with which we operate determine what we take to be facts (pp. 47, 240), organize our perceptions (p.103), suggest where novelties might be discovered (p.124), prescribe methods (pp.160-1), and establish the grounds of competence within a specialty (318-19). Even though we dwell within these frames of reference, and employ them to reach definite decisions, we are unable to map them completely—we do not have the capacity to see clear through ourselves and to determine what affects us most deeply.

I am not speaking of the specific assertions which fill the textbooks, but of the suppositions which underlie the method by which these assertions are arrived at. We assimilate most of these presuppositions by learning to speak of things in a certain language. . . . The curious thing is that we have no clear knowledge of what our presuppositions are and when we try to formulate them they appear quite unconvincing (p.59).

We certainly have tacit knowledge of our premisses—they make their presence felt in every decision we make—but they are not wholly under our intellectual control (pp. 162, 165). The most influential ideas in our intellectual lives are not 'clear and distinct' ideas, but, like the roots that give life and support to great trees, are hidden in tangled masses deep beneath the surface of consciousness.

Interpretative frameworks do not stand alone, but interact with each other. In the following passages, the phrase, 'vision of reality' seems to mean an ultimate interpretative framework:

Scientific discovery reveals new knowledge, but the new vision which accompanies it is not knowledge. It is less than knowledge, for it is a guess; but it is more than knowledge, for it is a foreknowledge of things yet unknown and at present perhaps inconceivable. *Our vision of the general nature of things is our guide for the interpretation of all future experience.* Such guidance is indispensable. . . . *our vision of reality*, to

which our sense of scientific beauty responds, must suggest to us the kind of questions that it should be reasonable and interesting to explore. It should recommend the kind of conceptions and empirical relations that are intrinsically plausible and which should therefore be upheld, even when some evidence seems to contradict them, and tell us also, on the one hand, what empirical connections to reject as specious, even though there is evidence for them—evidence that we may as yet be unable to account for on any other assumptions. In fact, *without a scale of interest and plausibility based on a vision of reality, nothing can be discovered that is of value to science*; and only our grasp of scientific beauty, responding to the evidence of our senses, can evoke this vision (p.135; emphasis added).

This ultimate interpretative framework is so fundamental that it can never be drawn fully into view, but can only be recognized as the ever-present substructure of the mind's more accessible operations. Intellectual passions are based on images of what is real. The mind does not see reality except by seeing it through these conceptual constructs and filters; in normal circumstances, one does not notice the frames of reference that are employed to make sense out of the world, because the conceptual frameworks function in subsidiary awareness, just as the eye does not see itself nor the ear hear itself when they are used to attend to the external world.

Polanyi's view of the tacit substructure of meaning is diametrically opposed to the rationalist project, modelled on algebra and geometry, of determining a few self-evident propositions from which all else can be derived. For Polanyi, a tacit vision of reality comes first not only in the exact sciences (165) but even in analytic sciences like mathematics (189, 257).

One's vision of reality—the ultimate interpretative framework—is something larger and less detailed than the theories that emerge from it, but without the perceptions and the passions generated by this all-encompassing, tacit vision, one

would not know how to go about setting up smaller and more manageable instruments of investigation. Tacit knowledge of our ultimate view of reality provides the foundation for *valuing* the formal operations of the mind. Before one can operate successfully within a formal system, one must be dedicated to it as something worthy of attention. Polanyi emphasized again that the personal appraisal of what counts as fact and which facts are to be counted as significant cannot be reduced to a scientific method—the art of science precedes the development of any formal techniques:

It is the normal practice of scientists to ignore evidence which appears incompatible with the accepted system of scientific knowledge, in the hope that it will eventually prove false or irrelevant. The wise neglect of such evidence prevents scientific laboratories from being plunged forever into a turmoil of incoherent and futile efforts to verify false allegations. But there is, unfortunately, no rule by which to avoid the risk of occasionally disregarding thereby true evidence which conflicts (or seems to conflict) with the current teachings of science. . . . Just as the eye sees details that are not there if they fit in with the sense of the picture, or overlooks them if they make no sense, so also very little inherent certainty will suffice to secure the highest scientific value to an alleged fact, if only it fits in with a great scientific generalization, while the most stubborn facts will be set aside if there is no place for them in the established framework of science (PK p.138).

For Polanyi, then, the intellectual passions that give science its peculiar character arise from the interpretative frameworks that guide the perceptions and judgments of scientists.

4 Dwelling in and breaking out of interpretative frameworks

While we rely on our conceptual frameworks to direct our attention and to make evaluation of experi-

ence meaningful, we must at the same time be willing to let those frameworks change under the impact of our heuristic and persuasive passions. So long as a framework of belief satisfies our intellectual passions, we 'dwell in' it, using it in a subsidiary fashion; when we are compelled by those same passions to convert to a different framework, we 'break out' of the old pattern (PK pp. 195-202). Polanyi sketched a threefold role for intellectual passions—selective, heuristic, and persuasive; the heuristic function of these passions is at the heart of self-emptying knowledge because it

links our appreciation of scientific value to a vision of reality, which serves as a guide to enquiry. Heuristic passion is also the mainspring of originality—the force which impels us to abandon an accepted framework of interpretation and commit ourselves, by the crossing of a logical gap, to the use of a new framework (PK p.159).

The power to empty ourselves of a former framework and enter into a new one clearly comes from the deeper vision of reality that remains unchanged in the moment of conversion. Nevertheless, to change our frame of vision is, in some measure, to change ourselves:

Having made a discovery, I shall never see the world again as before. My eyes have become different; I have made myself into a person seeing and thinking differently. I have crossed a gap, the heuristic gap which lies between problem and discovery.

Major discoveries change our interpretative framework. Hence it is logically impossible to arrive at these by the continued application of our previous interpretative framework. . . .

We have to cross the logical gap between a problem and its solution by relying on the unspecified impulse of our heuristic passions, and must undergo as we do so a change of our intellectual personality. Like all ventures in which we comprehensively dispose of ourselves, such an intentional change of our personality requires a passionate motive to accomplish it. originality must be passionate (PK p.143).

There is a cost involved in making such changes within ourselves. old habits die hard. New terminology and new methods of operation will have to be practiced until the language and skills defined by the new framework are assimilated as tacit knowledge. The intellectual passions rooted in our vision of reality, the ultimate interpretative framework that upholds our highest ideals of truth, enable us to pay the price of such conversions.

When two interpretative frameworks are in conflict, the resolution of their differences take place by appeal to the larger visions of reality that uphold them. The ultimate grounds of judgment will be informal, passionate and personal (PK p.189), even though the frameworks themselves may provide formal operations of argument within the system they establish:

Formal operations relying on one framework of interpretation cannot demonstrate a proposition to persons who rely on another framework. . . . Proponents of a new system can convince their audience only by first winning their intellectual sympathy for a doctrine they have not yet grasped. Those who listen sympathetically will discover for themselves what they would otherwise never have understood. Such an acceptance is a heuristic process, a self-modifying act, and to this extent a conversion. It produces disciples forming a school, the members of which are separated for the time being by a logical gap from those outside it. They think differently, speak a different language, live in a different world, and at least one of the two schools is excluded to this extent for the time being (whether rightly or wrongly) from the community of science (PK p.151).

Because the vision of reality that enables one to choose among conflicting conceptual frameworks is a primarily tacit and essentially personal commitment, the dispute between frameworks almost necessarily descends to *ad hominem* remarks: 'In a clash of intellectual passions each side must inevitably attack the opponent's person' (PK pp.151-2, 150, 318-19). This fact is not a licence to abandon whatever

formal or quasi-formal arguments there are to be made to demonstrate the inadequacy of the conflicting theories, but it is a comfort to realize why such conflicts 'may be tragically inevitable' (PK p.159-60):

We have seen that to the extent to which it represents a new way of reasoning, we cannot convince others by formal argument, for so long as we argue within their framework, we can never induce them to abandon it. Demonstration must be supplemented, therefore, by forms of persuasion which can induce a conversion. The refusal to enter on the opponent's way of arguing must be justified by making it appear altogether unreasonable. . . . He will be made to appear as thoroughly deluded, which in the heat of the battle will easily come to imply that he was a fool, a crank, or a fraud (PK pp.151-2).

There is no guarantee that one will succeed in inducing conversion in another. The risk of appearing 'altogether unreasonable' oneself as the argument progresses is part of the price one pays in adopting and defending a fundamental position (PK pp.viii, 93-4). This is why Polanyi speaks so much about 'commitment' in the last chapter of Part Three. Commitment is required to dwell in any conceptual framework, even in mathematics, for there is no formal system to compel the adoption of the principles upon which the formal systems of mathematics rest (PK p.294); on the same grounds, Polanyi portrays the other fields of science as systems of belief, sustained by the personal and passionate commitments of the scientists themselves (PK p.171).

To this point, Polanyi's description of changing interpretative frameworks strongly resembles Kuhn's description of paradigm change. At a superficial level, one might integrate Kuhn and Polanyi by finding a way of correlating their guiding metaphors. A paradigm might be recognized as the embodiment or the symbol of an interpretative framework; it is possible that an interpretative frame-

work could include several paradigms, in the sense of model problems. The notion of paradigm has escaped from that narrow meaning, however, as Kuhn notes in the 1969 'Postscript' to *The Structure of Scientific Revolutions* (pp.181-2). In the larger sense of the word, *paradigm* covers much the same ground as *interpretative framework*; both of them

- ♦ 1. create jargon;
- ♦ 2. identify significant data;
- ♦ 3. suggest canonical interpretations of the data;
- ♦ 4. divide one school from another;
- ♦ 5. define formal operations for practitioners;
- ♦ 6. are surprisingly fruitful, even when wrong;
- ♦ 7. explain the history of science in a satisfying fashion;
- ♦ 8. depend on commitment;
- ♦ 9. exhibit a tacit/articulate structure.

Neither Polanyi nor Kuhn seem to have noted dissonance between their positions. They trade complimentary footnotes: Kuhn honours Polanyi twice for his reflections on tacit knowledge (1970, 44f 191), while in the 1964 Introduction to *Science, Faith and Society*, Polanyi lists Kuhn as one whose 'conclusions overlap my own' (SFS pp.12-13). A recent collection of essays, *Paradigm Change in Theology: A Symposium for the Future*, edited by Hans Küng and David Tracy (1989), depends almost entirely on Kuhn's model of paradigm change; the only essay which mentions Polanyi, 'The Dialectics of Theory and Praxis within Paradigm Analysis' (pp. 63-109), by Matthew Lamb, unfortunately treats the two positions as practically identical. In 'A Comment on Polanyi and Kuhn', Maben Walter Poirier notes that Imre Lakatos, Israel Scheffler, John Watkins and Jack Meiland all fail to realize 'the very obvious

opposition that exists between Polanyi's position on the one hand, and that of Kuhn and his associates on the other' (1989, p.260).

Although they have much in common, Polanyi's affirmation of the moral and metaphysical foundations of science seems to set him apart from Kuhn's more positivist approach. Kuhn's advantage over Polanyi is primarily rhetorical. In *paradigm*, Kuhn found a word with powerful connotations. The poetry of the word has survived his own efforts to replace it with 'disciplinary matrix,' a term almost as unspeakable as 'interpretative framework.'

5 Conscience and truth

When two interpretative frameworks clash, one way in which the appeal of a new framework is expressed is to say that it is more 'beautiful' than other alternatives. While Polanyi often speaks of the aesthetic dimension of scientific passions, he holds that the ultimate beauty of a theory lies in its truth.

I believe that by now three things have been established beyond reasonable doubt: the power of intellectual beauty to reveal truth about nature; the vital importance of distinguishing this beauty from merely formal attractiveness; and the delicacy of the test between them, so difficult that it may baffle the most penetrating scientific minds (PK p. 149).

Polanyi described truth as 'the achievement of a contact with reality—a contact destined to reveal itself further by an indefinite range of yet unforeseen consequences' (PK p.147). This is not a definition that can be used in a formal way to determine what is and is not true, but a characterization of a fundamental concept in Polanyi's worldview. Just as Plato came to the conclusion that justice is what the just man thinks it is, so it may be that truth is what the wise man thinks it is. The recognition of truth is an art that cannot be reduced to a rule:

Nor do I deny, of course, that science is constantly in danger from the

incursion of empty speculations, which must be watchfully resisted and cast out; but I hold that the part played by personal knowledge in science makes it impossible to formulate any precise rule by which such speculations can be distinguished from properly conducted empirical investigations (p. 153).

Polanyi knew what he meant by 'truth,' even if he did not and could not provide a testable, operative definition of the term valid for all conceivable contexts in which it might be employed. We seize truth gladly when we recognize it, because we desire it passionately, even if we cannot spell out all we know about it or say precisely how it is that it came our way.

'Conscience', as such, is not a term that Polanyi uses frequently in *Personal Knowledge*; the word does not appear in the index of that book; the correlative terms in this work are values, ideals, intellectual passions, and self-set standards. He does use the word in one very illuminating context:

Intellectual commitment is a responsible decision, in submission to the compelling claims of what in good conscience I conceive to be true (PK p. 65).

Although Polanyi's highest standards are 'self-set' in the sense of being personally endorsed, they clearly have the hallmarks of placing us before 'something exterior'—Polanyi's notion of 'reality' which functions like a tribunal to which the mind submits and over which the mind ultimately has no power.

Not all readers agree on the weight to give to Polanyi's comments on 'contact with reality' as the source of truth in science. Poirier's objective in her 'Comment on Polanyi and Kuhn' is 'to show that Polanyi is a philosophical realist, and not a radical relativist like Kuhn' (1989, p. 261). Aaron Milavec takes quite a different tack in his reading of the same passages:

Even though Polanyi used phrases such as "contact with reality", he never wanted to imply that the discoverer has some direct or indirect access to reality as epistemological

realists have implied. Nonetheless, one finds interpreters of Polanyi who dress up his post-critical philosophy in the clothes of critical realism. T.F. Torrence, for instance, in his address to the Polanyi Society meeting in 1975, repeatedly committed this mistake (1989, p. 10).

In the 1991 Polanyi Society meeting, the debate continued in response to a presentation by Ronald Hall. While I appreciate Milavec's warning that Polanyi should not be carelessly associated with other 'epistemological realists', I believe that Poirier has the preponderance of evidence on her side in favour of the conclusion that Polanyi intended to develop a post-critical realism. As indicated in the preceding section, a scientist's vision of reality is the fundamental, tacit interpretative framework that all articulate frameworks depend on for meaning. The intellectual passion of conscience depends upon the conviction that one is being guided by something not of one's own making in the formation of all constructs that are of one's own making.

Polanyi's most explicit treatments of scientific conscience appear in his earlier collections of essays, *Science, Faith and Society* (pp. 15, 39, 40-2, 45-6, 56-7, 66-7, 80-84) and *The Logic of Liberty* (pp. 4, 40, 43-4, 200). Polanyi notes the important role of conscience in the development of a discovery: the scientist

breaks the law as it is, in the name of the law as he believes it ought to be. He has an intensely personal vision of something which in his view henceforth everyone must recognise Therefore, his most personal acts of intuition and conscience link him firmly to the universal system and the canons of science (L.I. p. 40).

In this work, Polanyi clearly sees conscience as constitutive of the scientific endeavour.

To guess the solution to a problem offered by nature—as demanded of the scientist—requires the exercise of intuitive faculties controlled by an intellectual conscience. They are the means for establishing creative contacts with a hidden reality (pp.43-4).

The Logic of Liberty ends with an endorsement of conscience as the key to balancing the conservative and progressive powers of the mind:

It remains in the last resort for each of us in his own conscience to balance the perils of complacency against those of recklessness. The danger that such ultimate decision may prove erroneous seems to be comparatively slight, so long as we continue humbly to search for guidance on matters over which we can never hope to achieve ultimate mastery (LL p. 200).

In the 1963 Introduction to *Science, Faith and Society*, Polanyi explicitly connects his reflections on conscience with the notion of commitment developed in *Personal Knowledge*:

... from beginning to end he himself is the ultimate judge in deciding on each consecutive step of his enquiry. He has to arbitrate all the time between his own passionate intuition and his own critical restraint of it. The reach of these ultimate decisions is wide: the great scientific controversies show the range of basic questions which may remain in doubt after all sides of an issue have been examined. The scientist must decide such issues, left open by opposing arguments, in the light of his own scientific conscience. My book *Personal Knowledge* . . . attempts to buttress this final commitment against the charge of subjectivity (SFS p.15).

The special character of personal knowledge—the fusion of the objective and subjective poles of knowledge—is therefore a matter of good conscience. In this collection, Polanyi speaks of ‘scientific conscience’ as the key to making contact with reality:

We see higher interests conflicting with lower interests. That must involve questions of conviction and of faithfulness to an ideal; it makes the scientist’s judgment a matter of conscience. Scientific conscience cannot be satisfied by the fulfillment of any rules, since all rules are subject to its own interpretation. . . . The scientist’s task is not to observe any allegedly correct procedure but to get the right results. He has to establish contact, by whatever means, with the hidden reality of which he is predicating. His conscience must therefore

give its ultimate assent always from a sense of having established that contact. And he will accept therefore the duty of committing himself on the strength of evidence which can, admittedly, never be complete; and trust that such a gamble, when based on the dictates of his scientific conscience, is in fact his competent function and his proper chance of making his contribution to science (SFS pp. 39-40).

It seems fair to say that for Polanyi, scientific certitude is a special form of moral certitude; without the guidance of the intellectual, scientific conscience, science could not stay in touch with a universe that defies complete formalization. He calls this ‘a moral element in the foundations of science’ (SFS p. 41). From Polanyi’s point of view, it is our intellectual passions, experienced as conscience, that move us to maintain the qualities of character required by serious investigation.

In ‘Authority and Conscience,’ Polanyi developed the theme that scientific knowing depends upon the personal integrity of the investigator:

We have seen that the propositions embodied in natural science are not derived by any definite rule from the data of experience. They are first arrived at by a form of guessing based on premisses which are by no means inescapable and cannot even be clearly defined; after which they are verified by a process of observational hardening which always leaves play to the scientist’s personal judgment. In every judgment of scientific validity there thus remains implied the supposition that we accept the premisses of science and that the scientist’s conscience can be relied upon (SFS p.41).

The great scandals that reach the general press, such as the vigorous debate about cold fusion or the inquiry into heart studies at M.I.T., serve as a reminder that scientific certitude depends upon the integrity and conscientiousness of scientists.

6 Metaphysics and mystery

Polanyi explicitly characterises his understanding of commitment to truth as a metaphysical standpoint:

Modern science arose claiming to be grounded in experience and not on a metaphysics derived from first principles. My assertion that science can have discipline and originality only if it believes that the facts and values of science bear on a still unrevealed reality, stands in opposition to the current philosophic conception of scientific knowledge It was attempt to vindicate the freedom of science against such teachings that made me realise the weakness of the strict empiricism which has dominated our conception of science throughout this century. I saw that this philosophy left science defenceless against the Soviet doctrine and this led me to decide that only on metaphysical grounds can we account for the intrinsic powers of human inventiveness. Here I met also the presuppositions of freedom in science. (TD p. 70, 81; cf. 82-3, 91).

It is in passages like these that Polanyi departs most radically from Kuhn and provides broad links between the fields of science and religion. There seems to be no larger horizon in Kuhn comparable to this metaphysical vision of Polanyi. It seems that everything Kuhn understands about paradigms can be mapped into Polanyi’s notion of interpretative frameworks, but not everything in Polanyi’s position finds a correlative structure in Kuhn’s.

Polanyi used problem-solving as his root model of knowledge:

The knowledge of a true problem is indeed a paradigm of all knowing. For knowing is always a tension alerted by largely unspecifiable clues and directed by them towards a focus at which we sense the presence of a thing—a thing that, like a problem, embodies the clues on which we rely for attending to it. This is the lesson derived from perception, which we have now to apply generally to the pursuit of knowledge by scientific inquiry (KB p.117).

Newman, who developed an epistemology surprisingly similar to Po-

lanyi's, discussed the notion of 'mystery' in the same way that Polanyi spoke of a 'true problem':

The pleasure of a search, like that of a hunt, lies in the searching, and ends at the point at which the pleasure of Certitude begins. Its elements are altogether foreign to those which go to compose the serene satisfaction of Certitude. First, the successive steps of discovery, which attend on an investigation, are continual and ever-extending informations, and pleasurable, not only as such, but also as the evidence of past efforts, and the earnest of success at the last. Next, there is the interest which attaches to a mystery, not yet removed, but tending to removal,—the complex pleasure of wonder, expectation, sudden surprises, suspense, and hope, of advances fitful yet sure, to the unknown. And there is the pleasure which attaches to the toil and conflict of the strong, the consciousness and successive evidences of power, moral and intellectual, the pride of ingenuity and skill, of industry, patience, vigilance, and perseverance (170-1).

'Mystery' plays no part in Polanyi's epistemology, though in one instance does compare the act of conscientiously striving to make contact with reality to 'the mystical contemplation of nature' (PK p. 133). By 'mystery,' Newman understood something that was partly known and partly unknown, not something totally incomprehensible:

A mystery is a proposition conveying incompatible notions, or is a statement of the inconceivable. Now we can assent to propositions (and a mystery is a proposition), provided we can apprehend them; therefore we can assent to a mystery, for, unless we in some sense apprehended it, we should not recognize it to be a mystery, that is, a statement uniting incompatible notions. The same act, then, which enables us to discern that the words of the proposition express a mystery, capacitates us for assenting to it. Words which make nonsense, do not make a mystery (p. 55).

Newman compared the use of language in the declaration of mysteries to the use of metaphors in language and to the use of 'practical approximation' in the sciences, calling such inexact-but-sufficient constructions 'an economy' (p. 56).

He felt that the experience of mystery was not limited to the religious realm. The recognition that reason's 'clearest and most vigorous exercise leads it by most certain steps to a termination from it simply revolts, baffled and amazed, is not peculiar to the theological doctrine before us' ([1844-1886] 1976, p.61). Although we not understanding everything about the object of our thought in a dogmatic proposition, 'we apprehend sufficiently to be able to assent to these theological truths as mysteries' [1864] 1967, p.60). Like the scientist who disregards imperfections in his model or like the poet who overlooks peripheral, incongruities in a metaphor, the believer senses that the statement of a mystery is 'on to something' and will lead somewhere, even if the way forward is full of perplexities. We know enough to know that we should hang on to this lead even though we do not know enough to spell out all of the relationships involved—we know enough to know how little we know. In this view, mystery is the origin, not the enemy of understanding, both in science and in religion.

For Newman, there was nothing so refreshing for the mind as to plunge deeply into the awareness of mystery and to experience itself being emptied of its preconceptions by contact with the divine reality. Polanyi anticipated similar intellectual pleasures to come from the quest to 'see the world in a new way':

This is, in fact, my definition of external reality: reality is something that attracts our attention by clues which harass and beguile our minds into getting ever closer to it, and which, since it owes this attractive power to its independent existence, can always manifest itself in still unexpected ways (KB pp.118-9).

Polanyi set no limits in advance on where contact with reality might lead the eager mind; in his conclusion to *The Tacit Dimension*, he expressed the hope that his reflections

might help to renew the life of faith:

Men need a purpose which bears on eternity. Truth does that; our ideals do it; and this might be enough, if we could ever be satisfied with our manifest moral shortcomings and with a society which has such shortcomings fatally involved in its workings.

Perhaps this problem cannot be resolved on secular grounds alone. But its religious solution should become more feasible once religious faith is released from pressure by an absurd vision of the universe, and so there will open up instead a meaningful world which could resound to religion (TD p. 92)

Ultimately, it is the commitment to eternity which empowers us to loosen our grip on our old ways of thought.

Not all such moments are equally pleasant. The self-emptying of Jesus as depicted by St. Paul began in the Incarnation and continued through the Crucifixion. The mind's willingness to be overthrown may well lead it into a dark night of knowledge at times—an awful moment of being lost in the quest for enlightenment. Even if one is not a disciple of Christ, one might still take comfort in the hope that the universe is so structured that the agony willingly embraced in the name of truth will be rewarded by something like resurrection from death.

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Notes:

1. Wallace explicitly rejects Kuhn's revolutionary model introduction to his first volume, *Medieval and Early Classical Science* (v-vi) and suggests an alternative model in the introduction to his second volume *Classical and Contemporary Science*:

'The work itself seeks such a justification of the ['cumulative growth of knowledge within the scientific enterprise'] through a historical examination and rein-

statement of the dual concept of causal explanation. Its central thesis is that the search for causal explanations has provided, and continues to provide, a reliable paradigm of scientific method from its origins in the late Middle Ages down to the present day' (p.v).

2. This is the main thesis of my dissertation for Catholic University, *Illative Sense and Tacit Knowledge: A Comparison of the Theological Implications of the Epistemologies of John Henry Newman and Michael Polanyi* (1991).

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In this paper, I shall try to show that, and how, Paul Feyerabend's philosophy of science was more than once influenced, to the extent of being re-oriented, by the work of Michael Polanyi. While I don't want to suggest that Feyerabend was a mere populariser of Polanyi (in the way Joseph Agassi seems to think that Kuhn was), my theses will be that Feyerabend, whose output was originally under the influence of very different thinkers, produced in the 1960's a rational model of science which synthesised their work with that of Polanyi and, in his later years, work which can best be understood as embodying certain themes earlier propounded by Polanyi (and others). I shall suggest that Feyerabend's reading of Polanyi was decisive in steering him away from normative epistemology, falsificationism, and intellectualism, and towards a conception of science as a set of practices.

1 Feyerabend's premisses

To make this case, I first have to show that certain components of Feyerabend's early work (by which I will mean what he published before about 1970) were antithetical to Polanyi's thought. This isn't too difficult. The dominant influences on Feyerabend's early philosophy of science were his dissertation supervisor, Viktor Kraft (a former member of the Vienna Circle), his later teacher Karl Popper, and the later work of Ludwig Wittgenstein. In Wittgenstein's *Philosophical Investigations* Feyerabend imagined that he saw the 'contextual theory of meaning' which he subsequently deployed, the view that the meaning of a term depends on its theoretical context. From Kraft and Popper, Feyerabend took, and developed more

uncompromisingly than anyone else, the idea that philosophy of science should be *normative epistemology*. According to these three, to attempt to practise descriptive or naturalistic epistemology is to capitulate to certain kinds of conservatism. Instead, the philosopher should aim to work out and *lay down* the methodological rules that scientists ought to follow.¹ As Feyerabend put it, in a passage he later came to regret:

[S]cientific method, as well as the rules for reduction and explanation connected with it, is not supposed to describe what scientists are actually doing. Rather, it is supposed to provide us with normative rules which should be followed, and to which actual scientific practice will correspond only more or less closely. It is very important nowadays to defend such a normative interpretation of scientific method and to uphold reasonable demands even if actual scientific practice should proceed along completely different lines. It is important because many contemporary philosophers of science seem to see their task in a very different light. For them actual scientific practice is the material from which they start, and a methodology is considered reasonable only to the extent to which it mirrors such practice. (1962, p.60, only partly reprinted in his 1981a, pp.68-9).

It should come as no surprise, then, that when Polanyi acknowledged the harmony between his work and that of certain contemporaries, in a new introduction to *Science, Faith and Society*, written in 1963, the list included Stephen Toulmin, Norwood Russell Hanson and T.S. Kuhn, but not Feyerabend. Despite his reputation nowadays as a philosopher of science in the 'historical' tradition, in this company, as I have elsewhere argued, Feyerabend should have been regarded as something of a fifth-columnist.

2 The first Polanyian turn: Feyerabend's 'model for the acquisition of knowledge'

However, Feyerabend was *already* under the (antithetical) influence of Polanyi. In moving from Bristol to Berkeley in the early 1960's, the spell Popper had cast over him gradually weakened. Discussing his own intellectual history, he later recalled:

[S]omewhere along the way I read an interesting paper by Michael Polanyi on the world view of the Azande. Here was a concrete application of Wittgenstein's advice to look and see and not to wander off on an abstract tangent (Munévar 1991, p.492).

('Wandering off on an abstract tangent' is how he later tended to characterise his erstwhile commitment to a strongly normative epistemology (see, for example, 1995, p.141)). The paper Feyerabend is referring to is surely 'The Stability of Beliefs', which Polanyi published in 1952. Unfortunately, Feyerabend gives us no idea of when he read it. But it is apparent to anyone who knows his work that, along with the work of Thomas Kuhn, this paper had a great influence on his thinking during the early 1960's. Instead of giving a mere list of the ideas this paper contains which surface in Feyerabend's 1960's work, I shall sketch his position at that time and give references to Polanyi's article. The position in question is embodied in what Feyerabend referred to as his own preferred 'model for the acquisition of knowledge', the construction of which occupies most of his important early papers.

As well as (or instead of) being held explicitly, theories, which are simply sets of beliefs, can be held *implicitly*, by virtue of reliance on a

particular language (Polanyi 1952, p.217). Languages, that is, can be profitably seen as, or as *containing* theories (pp.219-20, 221). Thus embodied, we can think of the most general theories as *conceptual frameworks*, structures which consist of fundamental presuppositions. But, when held in this form, theories are less susceptible to criticism than when presented explicitly. People are capable of protecting their belief-systems by explaining away evidence which, to a non-believer, would clearly seem to refute them (p.220). Conceptual frameworks are, or can be, highly 'stable' doubt-proof systems, and their hold on our minds can amount to a rather frightening monopoly on our cognitive resources (pp.218, 225). The classic kind of 'falsification' envisaged by naive falsificationists is not allowed to occur, and for a good reason: if we were not tenacious ('dogmatic') in defence of our theories, we would have no theories at all, for *all* interesting theories are assailed by troubling counter-evidence.

Conceptual frameworks protect themselves and evade falsification using various strategies: by the circularity of their supporting arguments, by the relations of mutual confirmation among their presuppositions, by their ability to generate 'secondary elaborations' which cover almost every conceivable eventuality, and by denying the ground of any alternative, rival conceptions (pp.222-5).

Marxism and psychoanalysis are prime examples of such 'conceptual frameworks'. So are the belief-systems which anthropologists have shown to be inherent in the languages of 'primitive people' like the Azande (p.220). These are alternatives to the conceptual framework of modern science. However, our rejection of these alternatives is not the result of the conscious application of the 'principle of doubt', but rather a matter of our enculturation (p.225). Whether we can give *good reasons* for our rejection is a moot point. In fact,

Polanyi proposed, in what he called 'a conscious affront to the critical tradition of modern thought' (p.218), that modern science, far from being a product of rational discussion within a 'critical community' (Popper), is a conceptual framework of just this kind, and is defended by the same sorts of mental operations as Zande witchcraft, Marxism and psychoanalysis. 'The process of selecting facts for our attention', he declares, 'is the same in science as among Azande', (p.230). Scientists themselves, when in the grip of a powerful conceptual scheme, blatantly ignore the counter-examples that plague it, writing them off as 'anomalies'. Feyerabend agreed.

How, then, are we critically to examine our own conceptual framework, the framework of fundamental presuppositions that constitutes modern science? Because of his Popperian background Feyerabend, I think, was more worried by this question than Polanyi. Polanyi's answer at this point, after all, was that the reasons we have to prefer science to magic, astrology, or communism, 'can never be adequately stated without a personal affirmation of belief on the part of the speaker' (p.230), and that to defend our belief-system we would have explicitly to declare our belief in science 'in fiduciary terms' (p.232). A Popperian like Feyerabend would, not unreasonably, consider this to be a capitulation to 'irrationalism'. But, ironically, Polanyi's article gave Feyerabend the resources with which to develop his answer. The single most important passage of that article, for Feyerabend, is undoubtedly the one that runs as follows:

So long as we use a certain language, all questions that we can ask will have to be formulated in it and will thereby confirm the theory of the universe which is implied in the vocabulary and structure of the language. It follows that we cannot state without self-contradiction within a language any doubt in respect to the theory implied by the language. The

only way to dissent from the theory of the universe implied in a language is to abandon some of its vocabulary and to learn to speak a new language instead. (Polanyi 1952, pp.221-2).

This passage, and the example of Svante Arrhenius' theory of electrolytic dissociation Polanyi subsequently mentions (p.228), clearly prefigure not only Feyerabend's famous 'theoretical pluralism', but also his argument for it, viz., that the only way to 'refute' theories which are so stable and comprehensive that they have ossified into conceptual frameworks is to mobilise or invent *another*, radically different conceptual framework which will show up by contrast the inadequacies of the existing framework.² This is Feyerabend's 'generalisation' of the idea of a crucial experiment.

But Feyerabend had *not*, at this time, assimilated Polanyi's message that the application of methodological rules (or 'maxims') always relies on personal judgment (p.219). In pursuing a rational model of science, he did not question, but rather relied on, the premise that he had taken from Popper and Kraft, that philosophy of science is the attempt to specify which methodological rules scientists should commit to if they really want to achieve progress, and that these rules *can*, if we are self-critical, be given a nice crisp application. In discussing his 'model for the acquisition of knowledge', Feyerabend said

I really hope that the occasional disparity between [this] model and actual scientific practice will be regarded as a criticism of the latter, not of the former. In the struggle between an ideal and actual reality the ideal must always be given the upper hand. After all, we do not want to leave the historical development of a discipline to chance (or to Oxford common sense); we want to shape it, and improve it in accordance with ideas we find reasonable. This was the way in which modern science and its philosophy started. (Feyerabend 1965, reprinted in 1981a, p.111).

What is more, the conclusions Feyerabend drew from his unholy mixture of Popper, Logical Positivism, and Wittgenstein would not have recommended themselves to Polanyi. To give just one indication: this period of Feyerabend's work culminates (for our purposes) in the brief 1969 article 'Science without Experience', in some ways the final fruit of his Popperian phase. Although its official target was *all* kinds of empiricism (including Popper's view that while theories can't be *supported* by experience, they should be *tested against* it), the burden of that paper was to argue that human experience is needed neither in understanding the principles of a scientific theory, nor in testing such a theory, nor in communicating the results of such tests. Rather, the entire labour of the scientist (in the 'context of justification', at least) could perfectly well be performed by a suitably-programmed digital computer. A stronger contrast with Polanyi's theme that scientific research is an art or skill that can only be transmitted by example within a social tradition can hardly be imagined. What has gone wrong here, I suspect, from a Polanyian point of view, is that Feyerabend had deployed a misguided causal theory of perception which he borrowed from the 'physicalism' of Neurath, Carnap and Popper.

3 A second Polanyian turn?: the research-immanence of methodology.

Nevertheless, by the end of the 1960s Feyerabend was prepared to retreat from *most* of the Popperian views he had previously held (falsificationism, scientific realism³, normative epistemology, methodological monism, etc.), as well as to write some rather uncomplimentary things about Popper himself. A conversation with the physicist Carl Friedrich von Weizsäcker in 1965⁴, together with the slow but steady influence of historical case-studies

of science, brought Feyerabend to see the poverty of the purely normative approach to philosophy of science. At this point, around the onset of his 'epistemological anarchism', another slew of Polanyi's arguments would have slipped into focus for him. When they did so, Feyerabend discovered (or perhaps more accurately 'rediscovered'⁵) that science cannot be characterised in terms of its deploying a single methodology. The theme which seeped from Polanyi into this 'middle' phase of Feyerabend's work is, I think, as follows.

Polanyi was willing to talk of scientific methods (e.g. SFS, p.16). But he opposed the production, by philosophers, of what he characterised as 'Sunday school precepts of the scientific method' (KB, p.100), as well as their attempts to discover 'rules of empirical inference', rules which would allow us to derive general propositions from observations. Observation supplies only 'clues' to the apprehension of reality (SFS, p.29). Bacon's rules, he claims, are a travesty. Sometimes he talks of there being no codifiable rules of scientific method (SFS, p.33) (and this can't mean only, as it might for Popper, that there are no rules for scientific discovery). On other occasions, his point seems only to be that rules of scientific research are irredeemably vague. At one point, he sums up his view thus:

I have distinguished . . . between two kinds of rules. I have said, for example, that there are no strict rules by which a true scientific proposition could be discovered and demonstrated to be true; but that this can be done by the light of certain vague rules embodied in the art of scientific research. I showed that even though some of these rules—which should be regarded as rules of art—are very rigid, they always leave a significant margin, and sometimes considerable play, to personal judgment. Strict rules, like those of the multiplication table, on the other hand, leave practically no room for interpretation. The two kinds shade imperceptibly into one another, but that does not invali-

date the distinction between them. (SFS, pp.57-8).

Feyerabend would certainly agree that methodological rules cannot be precise and algorithmic. Further, despite his well-deserved reputation for 'epistemological anarchism', in his more considered later presentations he stressed not the absence but rather the *research-immanence* of methodological rules. After one of his clearest rejections of methodological monism (the thesis that there is a single method which makes all good science *science*) he assures us that:

The remarks made so far do not mean that research is arbitrary and unguided. There are standards, but they come from the research process itself, not from abstract views of rationality. (1978, p.99).

In other words:

[S]cience never obeys, and cannot be made to obey, stable and research-independent standards: scientific standards are subjected to the process of research just as scientific theories are subjected to that process; they do not guide the process from the outside. (1981a, p.xiii).

Although I don't claim that Feyerabend was explicitly influenced by Polanyi here, I think one could say that this is his way of putting what he would have found congenial in Polanyi's rejection of logicism.

4 Science as art.

The second phase of Feyerabend's output which really bears comparison with Polanyi begins in about 1980. Again, I don't have space for a lengthy account of these later phases of Feyerabend's work (one that would take into account all his changes of mind!). So I'm going to try for a sort of composite picture of 'later-Feyerabend-as-influenced-by-Polanyi' which highlights those Polanyian themes Feyerabend most approved of. We will see a mix of ideas, some of which Feyerabend had already taken on board by 1980, along with others, he only

really came to assimilate in his last work.

In general, Polanyi offers us a value-based epistemology of science, rather than a rule-based one. He prefers to stress that scientific research is a delicate, personal and unspecifiable skill or *art*, an art which cannot be much assisted by formulated precepts (SFS, p.34), and he insists that insofar as scientific discovery is a matter of rule-following, its rules should be conceived of as 'rules of art'. Like those of all higher arts, these rules are embodied in practice alone, and can be transmitted only by masters of the art, and only by examples of the practices embodying them (SFS, pp.15, 33, 58). Becoming a scientist is likened to becoming a representative of an artistic *tradition*. Science can exist, and continue to exist, only because its premises can be embodied in a tradition which can be held in common by a community (SFS, p.56). In the transitions between generations of scientists, the rules are subject to the possibility of *re-interpretation*. Science is a tradition which, 'in transmitting itself to a new generation' invites opposition to itself (SFS, pp.15-6), and then assimilates it.

Feyerabend, too, came to think of science as an art⁶. But the lesson he wanted to draw from this assimilation was explicitly relativistic. He argued that the history of painting shows it to involve experiment, theory, and the same pattern of development as the sciences. Science cannot be demarcated from art by any criterion of 'progress'. Neither art nor science develops from imperfect to improved understandings and representations of the world, or reality. Such an interpretation of history 'is not compatible with our historical knowledge today' (1984b, p.20). The concepts of 'truth' and 'reality' are not neutral ones which can be used to support the judgment that sciences approach the representation of reality, whereas arts don't. Rather, both science and art exhibit a

plurality of different styles (styles of thinking, styles of representation), each of which is internally perfect and obeys its own rules. There is change, but no 'progress' or decline'.

Although Feyerabend's taking up the theme of science as art might be put down to the influence of Polanyi, I think it also has a more remote origin, in the work of Ernst Mach. Mach was one of the figures Feyerabend admired most openly, and in his later years he undertook to rehabilitate Mach from the one-sided positivist interpretation fuelled by the Popperian tribe, and by Lenin⁷.

Under the influence of Mach, Feyerabend argued that scientific research is an unformalisable skill, to be investigated through descriptive-historical studies of science, rather than by philosophy of science (toward which Feyerabend was always rather dismissive). Feyerabend emphasises Mach's use of the concept of '*finesse*', a clear precursor of Polanyi's concept of 'tacit knowledge'⁸. Research, according to Mach, is an art which, because it cannot be taught as a code of rules, cannot be mechanised, or even *routinised*:

In the 19th century the idea of an elastic and historically-informed methodology was a matter of course. Thus Ernst Mach wrote . . . 'It is often said that research cannot be taught. That is quite correct, in a certain sense. The schemata of *formal* logic and of *inductive* logic are of little use for the intellectual situations are never exactly the same. But the examples of great scientists are very suggestive'. (Feyerabend 1993, p.10, note 5).

Science must therefore remain the domain of trained scientists: it cannot be performed by technicians, automated 'under-labourers' (whether human or mechanical, like Feyerabend's robots or digital computers). For Feyerabend, just as much as for Mach, such automation would not be desirable, even if it were possible. Feyerabend, as we shall later see, eventually left be-

hind the influence of Logical Positivism and Popper, coming round to Mach's view that science is not a *linguistic* phenomenon (whose content must be explicitly statable, and therefore mechanisable), but a set of *practices*.

5 Rôles for personal judgment.

For Polanyi, the rôle of personal decision and judgment in science was 'the fundamental problem of epistemology' (SFS, p.13). (Contrast Popper, for whom the fundamental problem of epistemology is the 'problem of the growth of knowledge'). He detailed several ways in which the application of rules must allow room for personal judgment.

Perhaps the most important of these is captured in the late Wittgensteinian insight that 'The application of rules must always rely ultimately on acts not determined by rule' (SFS, p.14). In applying the (vague and implicit) rules of research, the scientist acts as both judge and jury, deciding how the rules should be applied *and* what should be accepted, on their basis, as true (SFS, p.39). Application of a rule depends ultimately on the scientist's *judgment*, since 'explicit rules can operate only by virtue of a tacit coefficient' (SFS, p.10). Therefore there is always a residue of personal judgment needed to decide what weight to attach to any particular evidence with respect to a scientific proposition (SFS, p.31).

Although the main thrust of his critique of logicist methodologies was against inductivism, Polanyi thought that it told against falsificationism too. Just as there are no rules for how to obtain a hypothesis from data, there are no rules for when to abandon a hypothesis. Such rules would be useless anyway, since 'all formal rules of scientific procedure must prove ambiguous, for they will be interpreted quite differently, according to the particular conceptions about the

nature of things by which the scientist is guided' (PK, p.167). Against the idea that scientific research consists in the following of precise and explicitly formulated rules, Polanyi objected that personal judgment is always needed to decide whether or not failures of fit between theory and evidence are to be disregarded as 'anomalies'. He insisted, as we have seen, that good scientists *do* sometimes ignore or explain away contrary evidence, reacting to refutation by 'setting aside' the recalcitrant data (PK pp. 12-3), and that they are often right to do so. It is up to the scientist's personal judgment to decide what counter-evidence invalidates a proposition (SFS, p.11).

At the very beginning of *Personal Knowledge*, Polanyi sought to draw attention to what he called 'the *personal participation* of the knower in all acts of understanding' (PK, p.vii. Cf. p.17). For Polanyi, knowledge is a fusion of the personal and the objective. It is personal in that knowing is an *activity*, 'an active comprehension of the things known, an action that requires skill' (PK, pp.vii, 17), or a *process*, a process of discerning the Gestalten which are aspects of reality (SFS, pp.9-11). He took himself to have shown that 'into every act of knowing there enters a passionate contribution of the person knowing what is being known, and that this contribution is no mere imperfection but a vital component of his knowledge' (PK, p.viii).

Unfortunately, this aspect of Polanyi's theory of knowledge exhibits certain conceptual confusions. Although he does not clearly distinguish between knowing and knowledge, his tendency to focus on the former is less helpful than Popper's focus on the latter. To treat knowing as an activity or a process is misguided since (i) the verb 'to know' cannot be modified by adverbs of manner, and (ii) there are no sensible questions like 'How long did it take to know that?' (as contrasted with 'How

long did it take to come to know that?'), which always do make sense when an activity or a process is being discussed.

Nevertheless, Polanyi has an important point to make against Popper here. Scientists and philosophers of science, he argued, have fallen victim to the attempt to specify the scientific method because of what he called 'a desperate craving to represent scientific knowledge as *impersonal*' (PK, p.169, emphasis added):

A scientist can accept, therefore, the most inadequate and misleading formulation of his own scientific principles without ever realising what is being said, because he automatically supplements it by his tacit knowledge of what science really is, and thus makes the formulation ring true. (PK, *ibid*).

Philosophers have mistakenly foisted upon science alien versions of the ideals of objectivity and detachment: there is no eliminating the human perspective from science. But this emphasis upon the personal aspect of scientific knowledge is not 'tended to portray knowledge as 'subjective'. Knowledge is still objective in that it is knowledge *of* a mind-independent and objective world, a 'hidden reality' that science reveals to us. This casts doubt on Popper's suggestion on that unless we direct our attention exclusively on the *products* of intellectual activity (statements, theories, arguments, etc.), we will be entangled in 'subjectivism'.

6 Intellectualism versus tacit knowledge.

The Polanyian theme which Feyerabend came most clearly to embrace is the existence and importance of 'tacit knowledge':

Subjects can become complex and successful only by turning the abstractions they contain into concepts that are guided not by rules (except locally) but by the tact and the

intuitions conferred upon its practitioners by a historical tradition. (1981b, pp.11-12).

Living in a particular world, an individual needs knowledge. An enormous amount of knowledge resides in the ability to notice and to interpret phenomena such as clouds, the appearance of the horizon on an ocean voyage, the sound patterns in a wood, the behaviour of a person believed to be sick - and so on. The survival of individuals, tribes, and entire civilisations depends on this kind of knowledge. Our lives would fall apart if we could not read people's faces, understand their gestures, react correctly to their moods. Only a fraction of this 'tacit knowledge' can be articulated in speech. (1987, p.106).

Feyerabend, like Polanyi, is keen to emphasise the non-rule-based components of methodology: hands-on experience, epistemological immersion, and the tacit knowledge and intuitive judgment which result. Rather than being thought of as an out-and-out opponent of scientific rationality, he should be seen as recognising that an essential part of scientific research consists in this unverbalisable kind of judgment, and not in the following of explicit rules. On this view, the rules that guide research are not only paradigm immanent but are *constitutive* (rather than merely prescriptive) of the paradigm in question. The 'rationalists' Feyerabend opposes tend to treat methodological rules as prescriptive, as governing an already existing activity from outside. Feyerabend, by contrast, can preserve the insight that rule-following activity is activity whose participants are capable of justifying their activity with reference to the rules they follow.

Tacit knowledge is the kind of not-wholly-verbalisable *savoir-faire* which cannot be explicitly taught. Instead, it can only be transmitted by experts, and can only result from hands-on experience. For its propagation and transmission, it relies on the continuity of living traditions, practices which involve apprenticeship. It is to be con-

trasted with *propositional* knowledge, the explicit and reliable ability to give a true answer to a question of the form 'Is it the case that *p*?'. Tacit knowledge forms the background to a multitude of human practices. It might be said to be that which the early Feyerabend missed because, (a) in his attempt to develop a 'model for the acquisition of knowledge', he conceived of knowledge as exclusively propositional, (b) his early scientific realism privileges theory over both observational and experimental practice, (c) his early semantics privileges theory over *use* (function, practice) and, finally, (d) he supposed (until his very last work?) that practice is accounted for by, and thus grounded in, theory.

There is no small irony in the fact that (a) and (d), common to Popper, Lakatos and Feyerabend,

comprise what used to be called '*intellectualism*': the tendency to see practice as being evaluated entirely in terms of whatever theory it contains.¹⁰ Where Polanyi and Toulmin argued that the intellectual content of science must be seen to include 'praxis', Lakatos, according to Toulmin,¹¹ refused to concede that science is more than a system of propositions and their inferential relations. Feyerabend eventually identified this same attitude as one of the most important weaknesses of his earlier work. 'As I see it today', he reported in 1995, the members of the 'Kraft Circle' (the University discussion group Feyerabend set up, centred around his dissertation supervisor),

mistakenly assumed that discussing an institution meant discussing its written products. More especially, we assumed that science was a system of

statements. Today that seems a slightly ridiculous idea, and the Vienna Circle is blamed for it. (1995, pp.74-5).

Whether Feyerabend ever really completely shook off the shackles of Popperian intellectualism is an excellent question. If he did not do so, it can fairly be said that Feyerabend was never really a member of the 'historical' school of philosophers of science. Rather, he started out as a Popperian, and swung over to historical relativism when he saw the 'methodological' basis of his critical rationalism crumbling.¹²

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Notes:

1. I have detailed and criticised this conception elsewhere (Preston 1994, and 1997a, Chapter 1).
 2. For a description and analysis of this argument, see Chapter 7 of my 1997a.
 3. For Feyerabend's retreat from realism, see my 1997b.
 4. See Feyerabend 1978, p.117, 144 note 7, and Feyerabend 1995, p.141.
 5. Because, I'm afraid, it looks as if Popper had already discovered it. See my 1997a, Chapter 3.
 6. See, especially, Feyerabend 1984a and 1983b.
 7. See, especially, Feyerabend 1984c.
 8. See Babich 1994. I am not forgetting that Polanyi, like Feyerabend, approved of Mach's critique of science (see PK, p.12).
 9. For the 'dilemma of ultimate commitment' that arises here, see my 1997a, Chapter 10, section 2.
 10. This term seems to have been introduced by Kant in the last chapter of his *Critique of Pure Reason* to refer to the view (now usually thought of as 'rationalism') that knowledge comes not from the senses but from the understanding. What I have in mind here, however, is the view (associated with anthropologists like Frazer and Evans-Pritchard, and criticised by Wittgenstein and Peter Winch) that very different 'belief-systems' can and should be evaluated by the standards of our system of modern scientific beliefs. Perhaps even Polanyi, in construing alternative conceptual frameworks simply as 'belief-systems' took for granted a kind of residual intellectualism.
 11. See Toulmin 1976. I am grateful to Chris Goodman for this reference.
 12. I hope to deal with Feyerabend's and Polanyi's divergent social and political conclusions in a future publication. For an attempt to assess the central themes in Feyerabend's political philosophy, see my 1997a, Chapter 10.
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SUMMARY

The Nature of Knowledge - Knowledge in Its Social Context

1. Intellectual and Professional Communities

1. Own language
2. Own methodology
3. Similar interpretative frameworks so that all members are able to look at the world in a similar way and use the same language and concepts, e.g. Marxist sociology, science.
4. Interlocking network of ideas.
5. Own tests for truth.

2. Religious aspect of I and P

1. Bound together by a mutual faith in the existence of an external reality.
2. Obsession or indwelling of researchers leading to a gradual revealing of reality (concept of different levels of reality or of interpretations).
3. Commitment to or faith in developing beliefs.
4. Commitment to reveal reality.

2. Sociological/political aspect of I and P

1. A community will have decision procedure - usually based on consensus - used for judging theories but also protecting the discipline from charlatans and cranks.
2. There will be people in authoritative positions who control points of power within the communities, e.g. professors editors, referees of journals, grants committees but also education.
3. There will be career and intellectual competition.
4. Tendency to protect the *status quo* and towards a relative gerontocracy.
5. Communities authoritative but also allow positive freedom for recognised members (a degree of

freedom to develop innovative ideas). Traditional but also a degree liberal.

6. A conservative element in the control of education and the necessity to develop skills.

3. Moral aspects of I and P

1. Obligation to reality, the truth.
2. Obligation to oneself as a practitioner.
3. Obligation to other members of the community.
4. Need for honesty and moral integrity.
5. Moral aspects are really fundamental in holding the communities together.

4. The Communities and Truth Claims

1. They judge truth claims against accepted knowledge.
2. Words truth/knowledge ascriptive terms with a quality of defeasibility, i.e. they can be ascribed or withdrawn depending on whether or not the criteria used in the process of acceptance have been met.
3. The content of knowledge will change over a period of time.
4. This raises certain questions:
 - (i) Is the procedure arbitrary? Possibly not if the core is stable, and change slow so that judgments can be made against a fairly stable body of ideas.
 - (ii) Indwelling, commitment, faith! Can we have objectivity? Really need a new but weak concept. If ideas are put forward into the public world in a form and language which can be understood by an I or P community so that they can be criticised and challenged, and allowed to stand on their own feet then perhaps that is objectivity.

Continued on the next page

An interpretative framework provides a systematic way of looking at reality and gives stability to our understanding. We can examine things from the viewpoint of an interpretative framework and have the possibility of understanding them and making judgments about them. A good example of the use of an interpretative framework is that given in Marxism. Certain features of the framework are well known. In order to illustrate its use we will develop a caricature of the framework.

Each society will be a class society, the ruling class will control the means of production, the state will be used by the ruling class to retain and enhance its power. The state will also have a parasitic element in it, so a bureaucracy will develop which will have a tendency to do things in its own interests. The rising class will be on the side of progress but, when it comes to power, will itself be a fetter on progress, and so on. Each part of the framework will fit together with the rest. In this sense the background, or framework for the individual theories will be made, as far as possible, systematic, coherent and, importantly, flexible. When an actual situation is studied, it will be studied from the point of view of the framework. The framework will, in effect, tell the researcher what to look for, and it will also indicate what facts are relevant and those which are not. The process of research will therefore tend to confirm the validity of the approach; contradictory evidence will tend to be considered not as a direct challenge to the interpretation but as a grounds for improving its sophistication.

In practice, then, conflict will be understood to be class conflict, evidence will be found to indicate the ruling class rules in its own interest, and so on. Even language will be carefully used to avoid challenging the framework. For instance, Marx, when examining the rule of Louis Philippe, King of the

French¹, finds that the ruling class, the bourgeois as a whole, are not ruling as the interpretative framework would suggest. In order to cope with the discrepancy, Marx calls the competing groups 'factions' of the ruling class, and not different classes. This was necessary for the coherence of the framework. At a more fundamental level, Lenin copes with the fact that capitalism has failed to collapse by developing his theory of imperialism. *Ad hoc* additions are made in order to preserve the framework, and to make it more flexible. The integrity and coherence of the framework is maintained in spite of the fact that certain anomalies have emerged. They are simply explained away.

In order that a framework is used researchers must be committed to it as providing the basis for research, and must immerse themselves in its form of analysis: one could almost say its spirit. They will believe it provides a correct base for research and, if followed, will be fruitful in revealing truths about situations which they are examining. As long as the framework is believed in, the framework will generally be fruitful. It will lead to further discoveries. Indeed it has a built in tendency to do this as it will lead to the choosing of evidence which will support its case. It will appear that reality itself is leading the researcher to further discovery.

We have considered so far the individual researcher but the individual researcher is often part of a community of fellow researchers. The community will have built up its own beliefs about the nature of reality, they will have developed their own systematic ideas, language, and tests for truth, as well as appropriate methodologies. In practice they will have developed and use similar interpretative frameworks. If they did not, they would not be able to understand each other, and would not be able to check on each others' truth claims. The community then will have an

informal decision procedure which will be used to examine new truth claims, protect accepted beliefs, and gate keep against charlatans and cranks.

The community will also have a moral dimension. It will have faith in the fecundity of its approach to reality, and a moral fervour in upholding it. It will have a series of interlocking moral obligations as it has to rely on the moral integrity of its members in undertaking research, gathering evidence, and producing arguments. As Polanyi suggests not only the individual researcher but the community must exhibit faith, indwelling (obsession), commitment and honesty.

By using a Marxist interpretative framework as an example I hope I have shown the reason for much criticism. For instance, the subjectivity that lies at the heart of the approach, its self-confirming nature, its protection against falsifiability, its uncritical nature, and its failure to get to grips with reality except through the interpretation of the framework. Of course, the fundamental catch-all criticism is that it is just not objective.

The acceptance of much of this criticism is why Polanyi called his great book *Personal Knowledge*. Yet Polanyi does not reject objectivity as such: what he rejects is pure objectivity. He does not rely on subjectivity, as for him subjectivity is just a whim. He does not rely on mere faith but on faith for good reasons. The concept of the impersonal observer, the cool, calculating machine, is not possible and not desirable. Discovery comes about though passion, obsession and commitment controlled by the desire to get at the truth. It is a matter of human judgment and like all such judgment it can be fallible and open ended.²

The very process of thinking involves making judgments and judgments can be understood only by looking at them in the context of different frameworks of ideas.³ There seem to be four possibilities when making a judgment:

1. A correct judgment in a correct interpretative framework.
2. An incorrect judgment in a correct interpretative framework.
3. A correct judgment in an incorrect interpretative framework.
4. An incorrect judgment in an incorrect interpretative framework.

All judgments must take place within an interpretative framework and can be understood and assessed only by reference to it. An interpretative framework is a way of looking at things in order to give some stability to our perceptions. We fit things into a framework so that we can understand and make judgments about them. We could, of course, also have neither judgment nor interpretative framework. However, this would be introducing new criteria and therefore should be distinguished from the possibilities that arose within a framework. We therefore have four possibilities (++ , -+ , +- , --). The fifth possibility is not in the same sequence; for instance, it would apply to non-thinking animals, e.g. rats with parts of their brains removed.

Polanyi uses his concept of interpretative framework as the major element both in his theory of discovery and in his theory of learning. He defines education in the following way: 'Education is latent knowledge, of which we are aware subsidiarily in our sense of intellectual power based on this knowledge'.⁴ He means by this that we cannot be certain of the extent of our knowledge. It is not something we can wear on our sleeves, continually exposed. It is something we know we possess, rather by our awareness of our own mastery of the subject matter in question than by our immediate awareness of all of the items of knowledge contained within that mastery. In this sense, education can be thought of as power, a power to control one's subject. In the intellectual sphere, it would mean that we had developed the conceptual power and ability to recognise instances of the things we know, and the ability to go beyond this to recognise new instances, and

to fit them into or framework of knowledge. We would have the ability to bring stability to these new instances by rejecting their randomness and by controlling them by fitting them into our framework. We would therefore have the ability to make them understandable to ourselves and to others.

This is a dynamic concept because it is a matter, not just of accommodating information, but of understanding it and developing the ability to use it. It is also orientated towards achievement, whereby we look for problems and attempt to solve them. In doing this, we gain control over things previously unknown. By continually searching out and solving new problems, and by understanding new experiences, we widen our base of knowledge and gradually modify the framework of our understanding.

Polanyi's idea of the interpretative framework is made more interesting by his development of the concepts of tacit knowledge and tacit integration which give an illuminating insight into the nature of knowledge and the development of our understanding. He argues that all of our explicit knowledge exists within a tacit framework. He means that it is surrounded by a whole body of known and unknown assumptions that give rise to our explicit knowledge and gives it context and meaning. This provides the framework for our judgment. It is, of course, possible to make some of this tacit knowledge known, i.e. make it explicit, but his argument is that we can never make it all known. If we try to do so, we are led to recognise that it is based on a regression of assumptions.

This argument brings out certain features of our understanding. The concept of tacit knowledge points to the fact that we can never be absolutely certain in our knowledge claims since they are always fuzzily edged as our explicit knowledge fades into its tacit framework. In other words to make a claim that we know is based on a judgment on

our part and, although we may feel our judgment is correct and are therefore committed to it, it will still be open to argument and debate.

This recognition, that our knowledge is fuzzily edged and merges into our non-expressed and inexpressible commitments and prejudices, means that in order to communicate with others and to be understood by them, we must develop a public language in which to express our ideas. We have to put our arguments in a form that will allow public debate, that is, be as objective as possible. It can be argued that the attempt to be objective indicates a commitment to the truth and that it is very easy to rely on our prejudices. It is then an intellectual achievement which allows public debate. This particular concept of objectivity also leads to the recognition that knowledge exists within a social context, i.e. within a public debate. Knowledge claims are assessed in public debate, and it is the public (consisting of other experts) that gives or fails to give, the claims the status of truth. The public can be wrong in its assessment, since the knowledge by which it judges truth claims is also fuzzily edged. The public will compare new claims with accepted knowledge and, of course, accepted knowledge can be wrong. In this sense, the public debate is never completely closed.

Polanyi actually sketches out how the dynamic process of knowing comes about. He calls it a process of 'tacit integration'.⁵ This integration happens when we attend from one set of objects to another. It has a from-to structure. We use subsidiary knowledge, knowledge that we are not looking at in itself, to attend to focal knowledge, something we wish to make explicit. We take the subsidiary knowledge as given and do not examine or criticise it, and then attend to something else. In this sense subsidiary knowledge has a functional relationship to focal knowledge.

There is necessarily a tacit component in all knowledge, a component that can never be completely revealed. We therefore cannot be entirely aware of the many facets of our own understanding. We cannot be completely aware of all of the dimensions of our interpretative framework, the influences of our peer group, or the influence of our own prejudices.

Judgments come about when we begin to concentrate on a problem, to focus the vast array of subsidiary knowledge on that problem. We have to immerse ourselves in the

problem and gradually move towards a solution. The immersion is not only intellectual but emotional, since it is making use of the skills, knowledge, and prejudices that we have acquired, which have become an extension of our own mind/body.⁶

Polanyi's picture of the scientific community and its use as a prototype for other communities is making the point that all knowledge claims are a matter of judgment and interpretation. There is a need for individual initiative but the initiatives lie within the traditional

framework of the community, and are controlled by its authority. The community is committed to the truth, and the researcher freedom lies in a positive duty to serve the truth. Without the bending nature of the undertaking interpretative frameworks and commitment to the truth coherence would vanish, and the community collapse. It is these obligations and commitments which hold the community together, and not the impersonal testing of hypotheses.

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2. Brownhill, R. 'Objectivity and Subjectivity in Polanyi's Personal Knowledge', *New Universities Quarterly*, Summer 1981, pp. 361-372.
3. Polanyi, *The Study of Man*, London, Routledge and Kegan Paul, 1959. Polanyi argues that all judgments take place within an interpretative framework.
4. Polanyi, M. (1958) *Personal Knowledge*, Routledge and Kegan Paul, p.103.
5. Polanyi believes that he is revealing the logical structure of tacit knowing by his from-to analysis but it really is an explanation of how we develop an understanding of tacit integration. See R. Harré (1977), 'The structure of tacit knowledge', *J. of the British Society for Phenomenology*, Vol. 8, No. 3, pp.172-7.
6. An expression used by W.H. Poteat (1985), *Polanyian Meditations: In Search of a Post-Critical Logic*, Durham (NC), Duke U.P.

It is my purpose in this paper to explore some aspects of the presuppositionalism of Thomas Reid (1710-1796) and Charles Hodge (1797-1878). I do so with the conviction that these two men represent an epistemological position which, though unacceptable to the later Enlightenment, has much to offer us in our post-Enlightenment morass. In particular, we can learn from their insights in these five areas:

- Our understanding of the world and of ourselves must start with the data of the world and of ourselves as we find them, rather than with some philosophical dogma.
- If such data are complex, so be it; we do not have to accept reductionism.
- The human person is much more than the reason; all aspects of human personhood, ranging from perception and experience through to moral and spiritual awareness, need to be accepted as part of the given, and allowed equal status in our epistemology.
- Truth thus is something richer and broader than the merely cognitive.
- Our understanding and living is necessarily based on presuppositions or first principles which are not required to be submitted to the bar of reason.

Roderick Chisholm has called Thomas Reid 'one of the greatest philosophers of all time'.¹ Lehrer tells the story of Chisholm being consulted by a man who said he had time to read just one serious book in philosophy; which should it be? The answer was Reid.²

Influential and respected in his day (he taught at King's College Aberdeen from 1751 to 1764 and was then Professor of Moral Philosophy at Glasgow until his death in 1796), he was regarded as the founder of the Scottish 'Common

Sense' school of philosophers whose works were very influential in France and America up to the middle of the nineteenth century. They then fell out of favour, and it is only in the last two decades that interest has been reawakened in the Scottish school, and especially in Reid.

1 Answering Hume

David Hume in his *Treatise* (published in 1739/40) and *Enquiry* (1748) effectively demolished the epistemological basis of the whole Enlightenment project. If Hume was correct, knowledge, as understood by the Enlightenment thinkers, was impossible. But everyone knew, Hume included, that knowledge was possible; and not only was it possible, it was very profitable and effective. The scepticism of David Hume did as little to lessen the confidence in the flood of ideas and discoveries and inventions and developments of the later eighteenth and nineteenth centuries, as the relativism and deconstructionism of the postmodernists have done to lessen our confidence in and reliance on contemporary technological society.

But an answer needed to be given to Hume's scepticism. It was not needed in order to provide a basis on which the Enlightenment could continue; rather, it was needed to provide an explanation why, despite Hume's objections, the Enlightenment project was continuing and was so hugely successful. In essence, two answers were given. The first was by Reid whose *An Inquiry into the Human Mind on the Principles of Common Sense* was published in 1764. The second was Kant's *Critique of Pure Reason* published seventeen years later.

Reid's work was widely read, not just in Scotland, but throughout Britain, America and Europe; he

was far more read during his life time than Hume as philosopher was read during his. His basic case was easy to grasp and was seen as providing both a clear answer to Hume and a firm basis for confidence in our knowledge. On the other hand, Kant's answer to Hume was slow to be disseminated in the English-speaking world; few could read German,³ and even fewer could understand what Kant was trying to say.⁴ For nearly a century, Reid was widely accepted as the man who had provided the explanation that justified the success of the Enlightenment project. Kant, on the other hand, was scathing about the Scottish response to Hume, and it was his alternative that ousted Reid's from the middle of the nineteenth century.

The basic difference between the two answers to Hume lies in the fact that, broadly speaking, Reid rejected while Kant accepted the main structure of Hume's epistemology. Reid thus was able to go behind Hume's system and produce a system that was, technically, pre-Humean. Kant accepted Hume's system, and attempted the harder task of demonstrating that it did not have to lead to scepticism. He was confident he had managed to do this, and so were his many followers in the English-speaking world of the later nineteenth and twentieth centuries. Others were not so confident. Bertrand Russell, writing in 1946, claimed that Kant had failed to assimilate or answer Hume's arguments⁵, and the verdict of many at the end of the century would go with Russell rather than with Kant.

But there is a further, and very significant, difference between Reid's and Kant's answers to Hume. Reid's answer is broader than Kant's. He deliberately and consciously rejected the pure ra-

tionalism of the main-line Enlightenment and introduced elements that belonged more to empirical science or psychology than to pure rationalism and philosophy in the twentieth century sense.⁶ This was unacceptable to those wholly dedicated to the total sufficiency and supremacy of Reason, but for those of us at the end of the twentieth century who favour a holistic approach to our theory of knowledge, it is enriching rather than detrimental. Kant, on the other hand, sought to continue to operate within the sphere of reason, though he managed this only by stretching the concept of reason and, in his *Vernunft*, introducing something which in fact allowed many later Kantians to develop systems that David Hume, had he lived that long, would have had a great time demolishing.

Reid's answer to Hume's epistemological scepticism was the rejection of the theory of ideas which Hume had inherited from the British empirical tradition, and which Reid located as the source of the Humean problem. This theory was developed by Hume's predecessors to explain why our perceptions and thoughts are sometimes fallacious: what is presented to the mind is not the object itself but some impression or idea of the object. But, said Reid, not only are these ideas obscure and unverifiable in themselves; their supposition leads into unacceptable scepticism; so they should be abandoned. The task of philosophy, for Reid, is to explicate what we are doing when we use language to describe our experiences; it is not to postulate unverifiable entities which ordinary men and women have no knowledge of and no need for, entities which were 'first introduced into philosophy in the humble character of images or representatives of things', but which have, in Hume, 'supplanted their constituents and undermined the existence of everything but themselves'. The choice is clear: if ideas exist, they alone exist; but 'common sense' declares

this is untenable; therefore ideas do not exist.⁷

2 Common sense

Instead, then, of perceiving ideas, we perceive objects or sensations, and our beliefs and concepts, or conceptions, arise in response to these objects or sensations directly from innate principles of the mind, without the intervention of rational processes. Reason, thus, is not primary or foundational in the sense that everything else is dependent on it for its justification. What is foundational is our basic constitution as human persons, the way we are made; we must start by accepting that, and working from it, rather than arbitrarily setting up reason as judge of everything, and landing ourselves in the unlivable solipsism and scepticism of David Hume.

When it is asserted that all our notions are either ideas of sensation or ideas of reflection, the plain English of this is, that mankind neither do nor can think of anything but the operations of their own minds. Nothing can be more contrary to the truth, or more contrary to the experience of mankind . . .

We have shown, on the contrary, that every operation of the senses, in its very nature, implies judgment or belief, as well as simple apprehension. Thus, when I feel the pain of the gout in my toe, I have not only a notion of pain, but a belief of its existence, and a belief of some disorder in my toe which occasions it; and this belief is not produced by comparing ideas, and perceiving the agreements and disagreements; it is included in the very nature of the sensation. When I perceive a tree before me, my faculty of seeing gives me not only a notion or simple apprehension of the tree, but a belief of its existence, and of its figure, distance, and magnitude; and this judgment or belief is not got by comparing ideas, it is included in the very nature of the perception. We have taken notice of several original principles of belief in the course of this inquiry, and when other faculties of the mind are examined, we shall find more, which have not occurred in the examination of the five senses.

Such original and natural judgments are, therefore, a part of that furniture

which Nature hath given to the human understanding. They are the inspiration of the Almighty, no less than our notions or simple apprehensions. They serve to direct us in the common affairs of life, where our reasoning faculty would leave us in the dark. They are a part of our constitution; and all the discoveries of our reason are grounded upon them. They make up what is called the *common sense of mankind*.⁸

It is perhaps unfortunate that both words in the phrase 'common sense' have developed in meaning since Reid used them. 'Common' for us tends to mean solely 'belonging to everyone'; 'sense' speaks to us of an intellectual ability. But 'common' in the early days of the phrase 'common sense', while meaning primarily 'belonging to all' had an additional nuance; and 'sense', of course, was frequently used with a non-intellectual meaning. The *Oxford English Dictionary* speaks of 'common sense' as 'an "internal" sense which was regarded as the common bond or centre of the five senses in which the various impressions received were reduced to the unity of a common consciousness'. This concept can be traced back to Aristotle, who used *koine aisthesis* 'to denote the faculty in which the various reports of the several senses are reduced to the unity of a common apperception'. The dictionary cites the later (and last) Scottish Common Sense philosopher, William Hamilton, commenting in his edition of Reid's works: 'The external senses and the common sense considered together are like a circle with five lines drawn from the circumference to the centre'; and Hamilton's definition of common sense as 'the complement of those cognitions or convictions which we receive from nature; which all men therefore possess in common; and by which they test the truth of knowledge, and the morality of actions'.⁹

'Common sense', then, is something that is related more closely to our five 'senses' than to our intellect, and yet that is more than a

passive recipient of data. It is a coordinator. It is an inner ability or power which we exercise in our direct comprehension of reality. It is something common to all, and it is something that we can trust.

3 *Philosophy and reality*

Reid insisted that we shape our philosophy according to the world and what we find in it (including ourselves) rather than seeking to shape the world according to some narrow philosophical dogma. We start with what we find in ourselves and in the world: perceptions and sensation and reason and experiences and objects outside of us and moral awareness inside of us; these are to be accepted as the given; indeed, we have no choice but to accept them. Should philosophy try to tell us that these things do not exist, trying to make us deny what we know, then philosophy must give way to reality. The danger with philosophy is reductionism; but, however attractive it may be to reduce everything to the simplest explanation, the result does not fit the world; the world is complex. We all know this, and must build our philosophy on the world as it is, not the world on some philosophy which we like because it is simple.

Faced with the increasingly narrow rationalism of the Enlightenment, then, Reid, argued for a considerably broader approach. The vision of the Enlightenment was to make reason the touchstone of everything else. Though himself a key figure in the Scottish Enlightenment, Reid resisted this trend. He saw in Hume and his predecessors the danger of reducing everything to the mental, so that only ideas exist. Subsequent thinkers have fallen into the opposite danger, of reducing everything to the material. Such narrowness of approach leads to absurdity, said Reid; and, for him, the proper response to absurdity is not so much philosophical argument (though he was prepared to provide that) as ridicule and a clear rejection of the premises that

have brought about the absurdity, in favour of a different and broader starting point.

Why, asks Reid, should we put all our confidence in one faculty, reason, and use it, as Hume had done, to deny the dependability of other aspects of human personhood, such as memory, sensation, perception, consciousness, our moral faculty, and, indeed, our common sense?

Reason, says the sceptic, is the only judge of truth, and you ought to throw off every opinion that is not grounded on reason. Why, sir, should believe the faculty of reason more than that of perception? — they both come out of the same shop, and were made by the same artist; and if he puts one piece of false ware into my hands, what should hinder him from putting another?¹⁰

Reason, then, is not the only judge of truth. It is but one among our several faculties, or innate powers of the mind.¹¹ If this is so, then we do not need to provide a rational justification for our acceptance of the reliability of our other faculties; the things we directly perceive or remember or experience may be taken as true without waiting to see if they pass the test of rational justification.

Philosophers, said Reid, who use reason to challenge the trustworthiness of our other faculties, such as perception or memory, are necessarily assuming the trustworthiness of reason. But it is arbitrary to assume the trustworthiness of just one of our faculties. After all it could never be possible to prove that reason is completely trustworthy; to prove this, we would necessarily have to assume what we are seeking to prove, namely the trustworthiness of reason. If, then, we cannot prove reason is trustworthy, we have no grounds for setting it up as arbiter over our other faculties. Granted, says Reid, we do feel sure that reason is trustworthy when it brings with it 'irresistible conviction'. But our other faculties also bring irresistible convictions, as, for example when I see and touch a tree. So all our faculties, reason

included, should be put on the same footing: where they produce irresistible conviction they are to be accepted as trustworthy.

While insisting that they are not fallacious, Reid had no problem accepting that all our faculties are fallible. Hume's mistake, he felt, was to accept the fallibility of all but one of our faculties, but insist on the infallibility of reason. But our reasoning can be mistaken, just as much as our perception or our intuitive ethical awareness. Nevertheless, said Reid, we can and do trust our reason and our perception and all our other faculties. In fact we have no choice but to do so; and in real life occasional errors do nothing to destroy that trust.

4 *First principles*

The faculties of the human mind, then, for Reid, operate according to first principles which are not themselves such that we can rationally demonstrate their validity, but rather such that we cannot live without them. It is impossible for us to reject them; a consistent sceptic, says Reid, could never know or say anything. Whether in the sphere of perception, or consciousness, or memory, or reason, we trust them, and they do not fail us.

Reid, and his successors in the Scottish school, gave a lot of thought to enumerating just what these first principles were. He readily accepted that there was room for debate, but insisted that this did not invalidate the concept. Tests for a first principle include: the absurdity of its contradiction, its coherence with other first principles, its universal acceptance, particularly if it appears 'so early in the minds of men' that it cannot be the result of education, and its necessity 'for the conduct of life'.¹² Examples of first principles listed by Reid are:

- ♦ That *I think*, that *I remember*, that *I reason*, and, in general, that *I* really perform all those operations of mind of which *I* am conscious'.
- ♦ That those things do really exist which we distinctly perceive by our

senses, and are what we perceive them to be.

- ♦ That we have some degree of power over our actions, and the determinations of our will.
- ♦ Logical axioms.
- ♦ First principles in morals. *That an unjust action has more demerit than an ungenerous one: That a generous action has more merit than a merely just one: That no man ought to be blamed for what it was not in his power to hinder: That we ought not to do to others what we would think unjust or unfair to be done to us in like circumstances.*¹³

And a foundational first principle:

- ♦ *That the natural faculties, by which we distinguish truth from error, are not fallacious*¹⁴

One of Reid's most significant first principles is that the mind has active powers. As we saw above, the mind is no mere passive recipient of 'data'. In his case against the ideal or representational theory, which claims that when we think of, say, a tree, we are in fact thinking of an idea or representation of that tree which in some way causes our thinking of it, he argued not only that it is unnecessary to posit the intermediate representation or idea (that is, we can think directly of a tree, without having to go via an intermediate tree-idea); he also claimed that the relationship between our thinking and the object is not a naturalistic static one, but one in which the mind is active; it has and exercises inherent powers, 15 powers of understanding which use innate principles to draw out knowledge, and powers of will; hence the titles of his two mature works, published after his retirement at age 70: *Essays on the Intellectual Powers of Man* (on understanding, reasoning, perception, memory, conception, judgment, etc.) and *Essays on the Active Powers of Man* (on will, appetites, affections, duty, choice, moral obligation, and the like).

5 Reid's presuppositionalism

Reid, then, in response to Hume's scepticism, developed a presuppositional philosophy which provided an explanation for the reliability of our knowledge and the success of the Enlightenment, and which strongly influenced the English-speaking world for the best part of a century, until it was ousted by the various forms of Kantianism. In summary, we will mention four aspects of his philosophy, which have relevance to us as we are faced with our contemporary challenge to the concept of truth.

In a sense, the most significant thing about Reid's presuppositionalism is his willingness to declare that he had presuppositions, and quite a few of them at that. Throughout the Enlightenment, there was a strong tendency among thinkers either to keep presuppositions to a minimum, or to deny that they had any at all. Reid resisted this tendency, and was quite open about his first principles, and appears to have enjoyed drawing up lists of them.

A second element which, like the first, has a familiar ring to late twentieth century thinking, is his insistence that he did not need to justify his presuppositions at the bar of reason. Since Descartes philosophers had felt obliged to defend their philosophical positions by convincing rational argument. Reid rejected this. We have no grounds for making reason the sole arbiter of truth; our common experience is that truth can be found through a number of faculties. Indeed, any rational argument we use in defence of reason's unique trustworthiness must necessarily presuppose what are trying to prove, and so be invalid. Rather, says Reid, we must start with the data, not with some dogma of parsimony; the world around us and the human mind are not parsimonious; they are complex, and if we are going to be true to reality, we must accept their complexity.

Reid is thus, thirdly, moving out from a narrow rationalism to a broader concept of truth, or, at any rate, of our means of apprehending truth. It sees men and women not just as rational intellects, but much more holistically, as observing and perceiving and willing, as making moral choices, as persons reacting with the world around us, not as passive machine-like recipients of data.

Fourthly, though he rejected the call to provide convincing rational justification of his fundamental presuppositions sufficient to confound the sceptic, Reid, writing as a philosopher, and wishing to persuade others of the correctness of his system, did give reasons why he chose his specific presuppositions. Basically, they were 'irresistible'; when presented with them we have no option but to accept them; denying them leads to impossibility and absurdity. Two other significant aspects he emphasised, which have a familiar ring, is the mutual coherence of his presuppositions, and the fact that they are necessary for the conduct of life. In defending his foundational principle of the trustworthiness of our faculties, Reid helpfully used the parallel of light: we have to assume the existence of light in order to see anything, and we have no difficulty in doing so. 'Light, which is the discoverer of all visible objects, discovers itself at the same time'.¹⁶

Turning to Reid's presuppositions themselves, we find that they are a mixed bag. Some are methodological, some are logical, and some may seem to have been unduly influenced by eighteenth century culture. As a rough classification we could divide them into three groups: foundational presuppositions, presuppositions that would be widely accepted as valid, and those that would not command such wide acceptance. In the first group come the closely related trio that we are endowed with a range of natural faculties, that these are not fallacious,¹⁷ and that we are to accept as true the data they present

to us when they deliver it with 'irresistible conviction'. In the second group come the axioms of logic, the existence of the conscious mind, and the existence of the external world, and perhaps one or two of Reid's moral axioms, such as 'No man ought to be blamed for what it was not in his power to hinder'.

A third group of Reid's presuppositions, more questionable in their validity, might, I suggest, contain some of his moral axioms, and, for example, his first principles that seem susceptible to the flat earth objection:

We ought likewise to take for granted, as first principles, things wherein we find a universal agreement, among the learned and unlearned, in the different nations and ages of the world.¹⁸

I need hardly say that I shall also take for granted such facts as are attested to by the conviction of all sober and reasonable men either by our senses, by memory, or by human testimony.¹⁹

We may also have to put in this third group Reid's confidence in the trustworthiness of memory, though he does qualify this by saying that memories must be 'recent' and 'fresh' to be acceptable.²⁰

One of the major criticisms levelled against the Scottish school is that they could not agree among themselves over just what should and should not be included in the lists of presuppositions. The argument has been used that this lack of agreement invalidates their whole position; if first principles are not universally self-evident to their friends, what hope have we of convincing the sceptics? In reply to this objection we could defend the school by pointing out that the disagreements were largely over the contents of the third group; there was a basic core they were generally happy to accept. We could also argue that disagreement over precisely what constitutes a presupposition does not invalidate the insight that we have to have presuppositions in order to make sense of the world; there is considerably

more disagreement at the end of the twentieth century over which are the correct presuppositions we should adopt; but at the same time there is general acceptance of Reid's insight that we must adopt some.

6 *Scottish Common Sense in America*

There has been a long tradition among American thinkers that the effect of the period of almost a century when Scottish Common Sense philosophy formed the basis of American intellectual life was negative and stultifying. According to Flower and Murphy,

it is now [1977] uniformly regarded as a wasteland of second-hand ideas servicing orthodox Calvinism; it is pictured as deriving from a Scottish backwater in European thought and as propagated there and in America through unbelievably drab textbooks. This jaundiced appraisal (which, among other things, leaves later idealisms and pragmatisms discontinuous and unrooted in American thought) is echoed with more or less enthusiasm by twentieth-century writers, from Blau and Curti to Riley and Werkmeister.²¹

Flower and Murphy themselves sought to correct this false impression:

So far from being a drag on the American Enlightenment, Common Sense Realism was a part of it. It was integral to that astonishing burst of intellectual energy that began in Scotland in the early eighteenth century and extended well into the nineteenth. This Scottish humanism resulted in a flourishing of the sciences and their applications.²²

The subsequent turn around in the attitude to the Scottish school in the past two decades has been breathtaking: witness Chisholm's comments about Reid at the start of this article. The Scottish philosophy is now seen as an integral and creative feature of the development of American thought, something

Americans built on and made their own, developing and adapting it to suit their own distinctive purposes, so much so that in a very real sense the Scottish philosophy became the American philosophy.²³ It has often been pointed out that the Declaration of Independence itself was moulded by Scottish philosophy, and the stress on common sense and foundational principles to which even the least speculative and poorly educated person had ready access fitted well into the emerging American mind-set.

The process of assimilation and adaptation and development of the Scottish philosophy can be seen in the Princeton school of theologians. Like the large majority of their contemporaries they were well read in the philosophers of the Enlightenment from Bacon and Descartes via the Scots to William Hamilton. Charles Hodge, the key figure at Princeton Seminary from 1840 to 1878, was also well read in German philosophy and theology; he was one of the first American theologians to study in Germany, and was responsible for one of the earliest articles explaining Kant's thought to be published in America.²⁴ Though, like all American thinkers of his generation, influenced by the Scots, Hodge avoided the extravagant praise of the Scottish philosophy indulged in by some of his contemporaries,²⁵ and would have strongly resisted the suggestion that the Scottish philosophy was the sole foundation for his own epistemology.

7 *Hodge's theological presuppositions*

For while Hodge shared with the Scottish school, and indeed with Hume and Kant, the conviction that, despite scepticism, our beliefs and knowledge about ourselves and the external world are to be treated as reliable and a sufficient basis for action, he differed significantly from them, and so from many of his contemporaries, in one key point: he openly recog-

nised that the basis of our confidence in the knowledge supplied by our faculties and experience had to be theological rather than philosophical. Philosophical scepticism on its own ground is unassailable; it can even resist Reid's irresistible conviction. If we are to accept the dependability of our experience of the external world it cannot be on the grounds of a rationally proved argument, but rather on the grounds of the nature of God, and especially of his relationship with the world. While Hodge was able to agree with the Scottish philosophers that 'it is universally admitted that we have no foundation for knowledge or faith, but the veracity of consciousness',²⁶ his own conviction went one stage deeper: 'The ultimate ground of faith and knowledge is confidence in God'.²⁷

It is perhaps no accident that the beginnings of Enlightenment epistemological scepticism coincided with the ascendancy of a deistic concept of God. Hodge's rejection of deism was total. For him nothing could be independent of God.

God is everywhere present, controlling all events, great and small, necessary and free, in a way perfectly consistent with the nature of his creatures and with his own infinite excellence.²⁸

As creator he has 'endowed all things material with their several properties or powers',²⁹ and, in particular, he is 'the author of our nature'.³⁰ The one who has created and controls the world, so giving it ontological stability and epistemological coherence, has endowed human persons, made deliberately in his image, with the means of obtaining accurate information about that world. 'The ultimate ground of knowledge is confidence in the veracity of God'.³¹

Hodge would readily have accepted that these were no new insights. They go back well before Reid to Bacon, Newton, and the seventeenth century scientists, with their theologically based confidence in the predictability of the natural order and the dependability of the

experience of the human observer. For Descartes, no sure knowledge of any sort would have been possible without God; but, once the existence of a God who would not deceive us, and on whom all else depended, had been established, he was able to claim 'Whatever I clearly and distinctly perceive is necessarily true'.³² In language that was frequently echoed at Princeton, he stated: 'I am indeed so constituted that I cannot but believe something to be true at the time of perceiving it clearly and distinctly' and thus 'The certainty and truth of all knowledge depends entirely on my awareness of the true God'.³³

The recognition of God as the ultimate basis for meaning and truth is a familiar concept through two millennia of Western thought. Hodge saw it as an inevitable implication of the Christian concept of a God who is not only creator and upholder of the world, but is personal, good, true, loving, relating, revealing, speaking and saving. A God like that would not leave us in total ignorance or cause us to be deceived; rather he would want us to know the truth, whether about himself, ourselves, or about the world he has put us in. If he made us and loves us, we can trust the means which he has given us to know that truth.

Here then are two closely related foundational presuppositions which Hodge held in common with a substantial part of the Western philosophical tradition and the early Enlightenment thinkers:

1. A God of love and truth has made the world, incorporating into it elements of his own nature such as consistency and dependability.

2. He has chosen to put into the world human persons made 'in his image' such that we can have true knowledge about it, about ourselves, and about God.

Hodge readily recognised the necessity of starting with presuppositions. In his introduction to *The Life of Kant* he criticised 'the Germans' for being unwilling to accept foundational principles, and

insisting rather on seeking to provide a philosophical explanation for everything. Such a goal is unattainable, he said: everyone has to stop somewhere, and accept foundational first principles.

That every effect must have a cause, is for Reid, a primary truth: he says, he cannot help believing it, the constitution of our nature forcing us to admit it. But Kant will explain, and denies that this appeal to consciousness, is a sufficient answer to the sceptic who denies the truth in question. For this purpose, he has recourse to a theory, which involves the denial of what every man, who is not a philosopher, holds to be true; and at last in his turn comes to an ultimate fact, which he is forced to admit on its own evidence. It is not wonderful, therefore, that Fichte should say to Kant, what Kant says to Reid, you have no right to assume as an ultimate fact, what you cannot prove, you cannot stop short in your career, it is the philosopher's business to explain everything.³⁴

And so on *ad infinitum*. So, says Hodge, we have to stop somewhere and take some foundational principle on trust.

Hodge has been accused of himself being as rationalistic as those he sought to oppose.³⁵ I have discussed these accusations elsewhere and shown that they are unwarranted.³⁶ Admittedly, Hodge, living in a rationalistic age, and seeing himself as an apologist for the Christian faith, was happy to use rationalistic arguments to presented his case to those who were willing to receive them, just as Luther or even Tertullian had done before him. But this does not mean that his whole system was built on rationalistic foundations. For example, he readily put forward his version of the traditional arguments for the existence of God. But he prefaced his presentation of them with

The arguments are not designed so much to prove the existence of an unknown being, as to demonstrate that the Being who reveals himself to man in the very constitution of his nature must be all that theism declares him to be.³⁷

The arguments have a place, but not pride of place. Pride of place goes to something quite distinct from rational conviction, the experience of God in our innermost being.

We can note an additional point here. Hodge saw his contemporaries, and especially the Kantians with their clear distinction between the understanding and the higher reason, as dividing the human person into segregated faculties, each functioning alone in its own sphere; with the intellect we apprehend rational truth, with the soul spiritual truth, with our moral faculty moral truth, and so on. Hodge resisted this strongly in favour of an integrated approach to the nature of human personhood which saw us functioning as a whole person, not as segregated parts.

As has often been stated before, the Scriptures do not make the sharp distinction between the understanding, the feelings, and the will, which is common in our day. A large class of our inward acts and states are so complex as to be acts of the whole soul, and not exclusively of any one of its faculties.³⁸

There is an element of feeling in our cognitions and an element of intelligence in our feelings . . . Truth is not merely speculative, the object of cognition; it has moral beauty . . . Knowledge includes love, wisdom includes goodness.³⁹

Our awareness, then of foundational principles is not a simple matter of just the intellect, or just the feelings or consciousness or moral sense. It is a complex apprehension, of the whole person.

8 *Presuppositions and God*

There can be little doubt that historically the Enlightenment itself rested upon the twin theological presuppositions of a God who created the universe, and made human persons 'in his image' such that they can have knowledge of the world around them, thinking God's thoughts after him. Though

essentially a humanistic movement in the sense that it gloried in the abilities of humans to discover and achieve, its humanism was theologically based. Bacon and Descartes and Newton and Locke did not just pay lip service to the role of the creator; for them it was the foundation of their confidence in their ability to discover and know. By the eighteenth century, of course, God was being pushed out of this central role to a safe deistic distance, and soon became dispensable. And at precisely that point the philosophical basis of the Enlightenment project fell apart.⁴⁰

Reid represents a brave attempt to salvage the philosophical base by reasserting the necessity of presuppositions that do not have to be rationally justified. He was a clergyman, and there can be little doubt that his theism underlay his approach to philosophy; his writings are littered with references to God. Nevertheless, he chose not to use theological presuppositions as the explicit basis of his philosophy. His God tends rather more towards deism than Hodge's, and at times is synonymous with Nature. Lehrer, aware that the references to God could make Reid's approach less attractive to contemporary thinkers, argues that the removal of God from Reid's philosophy and the substitution of evolutionary theory would leave his system intact.

Reid often insists that what is necessary in the way of conception and belief for our safety and preservation is not left to reason but is established by nature. Such conception and belief is invariable and irresistible as a result of our constitution. Reid thought that these principles of our constitution were the product of nature and that nature was the product of God. His philosophical doctrine, however, concerns utility, not divinity. It is that nature produces what is necessary for our security and preservation, or, in more modern terms, for our survival and adaptation. Consequently, these conceptions which are necessary for our survival and adaptation result from our nature, from innate principles of our constitution.

It is an interesting exercise for the modern reader to substitute the prin-

ciple of natural selection for Reid's principle of divine benevolence. By doing so, one will obtain a thoroughly modern doctrine. Reid, like many contemporary authors, held that the basic principles of the human mind are those necessary or useful for survival and adaptation to practical and social life. It is this doctrine that accounts for his affirmation in the *Essays* both that our conceptions of primary qualities result from generalizing in a way that is useful for our preservation and adaptation and that those conceptions are the product of innate principles of the human mind. In general, moreover, Reid poses the question, as a contemporary author might—What cognitive principles are necessary for our survival and adaptation? Those that appear necessary are assumed to be the result of innate principles of the mind provided they satisfy the other criteria of innateness: early appearance, universalisability, irresistibility, and so forth. Nativism is the mother of necessity.⁴¹

Lehrer may be right in saying that Reid's system lends itself to such updating. But the concept of the survival and adaptation of the human race may not be readily accepted by everyone as the necessary and inevitable first principle Lehrer seems to picture it. It is quite conceivable, for instance, that the destruction of the human race may be decidedly beneficial for our planet or universe. We are back to the question which all who seek to explain everything by some anthropic principle or process of cumulative selection or the like have to face: Does not the fact that it is possible to question the ultimate principle or explanation itself demonstrate that it cannot be ultimate? The theologian, of course, has to face the same question, though she or he may have an easier job answering it since ultimacy has generally been conceived of as a necessary aspect of divinity. To answer 'What caused God?' with 'He is uncaused' may be more acceptable than answering 'What caused the anthropic principle (or the Big Bang)?' with 'It was uncaused'.

My own judgment is that Reid would never have developed his presuppositionalism if he had not

covertly based it on his own theistic convictions. In this sense, Hodge was the more consistent of the two, keeping closer both to the general course of Western thought and the development of the early Enlightenment. In his theological presuppositions he provided what Reid failed to provide, a basis for the first principles of the human mind.

Notes:

1. K. Lehrer, *Thomas Reid*, cover.
2. *ibid.* p.1
3. E. B. Pusey stated that in 1825 'only two persons in Oxford were said to know German'. H.P. Liddon, *Life of Edward Bouverie Pusey*, I p.72. This may be a mild exaggeration.
4. As late as 1841 the *American Eclectic* stated that Kant 'has seldom been understood except by his reflective and speculative countrymen'. G.J. Joyaux 'Victor Cousin and American Transcendentalism' in B. M. Barbour (ed), *American Transcendentalism: An Anthology of Criticism*, p.133.
5. B. Russell, *History of Western Philosophy*, p.646.
6. 'Philosophy', of course, was still being used in a very broad sense in Reid's day.
7. T. Reid, *An Inquiry into the Human Mind on the Principles of Common Sense*, p.108.
8. *ibid.* p.209.
9. T. Reid, *Works*, ed. Hamilton, II p.756, cited *Oxford English Dictionary*, s.v. *common sense*, II p.695.
10. T. Reid, *Inquiry*, p.183.
11. Reid's definition of the faculties of the mind is 'those powers of the mind which are original and natural and which make a part of the constitution of the mind', *Inquiry* p.221.
12. K. Lehrer, *Thomas Reid*, pp.155-156
13. T. Reid, *Inquiry*, pp.231. 445, 446, 452, 453-4
14. *ibid.* p. 448
15. 'When I look upon the wall of my room, the wall does not act at all, nor is capable of acting;

the perceiving it is an act or operation in me', T. Reid, *Essays on the Intellectual Powers of Man*, p.254, cited K. Lehrer, *Thomas Reid*, p.98.

16. T. Reid, *Essays on the Intellectual Powers of Man*, p. 448.
17. 'If any truth can be said to be prior to all others in the order of nature, this seems to have the best claim: because. in every instance of assent, whether upon intuitive, demonstrative, or probable evidence, the truth of our faculties is taken for granted, and is, as it were, one of the premises on which assent is grounded', *ibid.*
18. T. Reid, *Inquiry*, p. 233
19. *ibid.*
20. *ibid.* p. 231
21. E. Flower and M.G. Murphy, *A History of Philosophy in America*, p. 203
22. *ibid.* p. 204.
23. It is interesting to note that the preferred title used by Americans for the Scottish philosophy was the 'English philosophy'. Scotland was, of course, part of England at the time; but the significance of the title lies in the fact that, despite 1776, the consciousness of English roots in Americans ran very deep: English was their language, and for most of them English (in its wider sense) blood still ran in their veins. So the English philosophy was not something alien; it was part of a common heritage, and belonged as much to the English settlers in America as to the inhabitants of Great Britain.
24. P.A. Stapfer, 'The Life of Kant' trans. C. Hodge, *Biblical Repertory*, 1928, pp. 303-350. Criticisms by E.R. Sandeen, echoed by James Barr in *Fundamentalism*, that Hodge ignored Kant and Kantian thought are quite unfounded. His time in Germany had a considerable influence on him, and he came near to adopting a moderate Kantian position, before withdrawing, partly as a result of the publica-

tion of H.L. Mansel's *The Limits of Religious Thought Examined*. See my forthcoming, *The Philosophy of Charles Hodge: A Princeton Theologian's Approach to Reason, Knowledge and Truth*.

25. Notably S. Tyler. See, for instance, his article on 'Psychology', *Princeton Review*, 1843, p.242.
26. C. Hodge, *Systematic Theology*, I p.214.
27. *ibid.* I p.52.
28. *ibid.* I p.616.
29. *ibid.* III p.694.
30. *ibid.* I p.56.
31. C. Hodge, *Princeton Review*, 1864, p.134.
32. R. Descartes, *Fifth Meditation*, in E. Anscombe and P.T. Geach (eds), *Descartes: Philosophical Writings*, p.107.
33. *ibid.* p.108.
34. C. Hodge, 'Introductory Remarks' to P. A. Stapfer, 'Life of Kant', *Biblical Repertory*, 1928, p.300.
35. For example W.A. Hoffecker, *Piety and the Princeton Theologians*, p.80.
36. P. Hicks, *The Philosophy of Charles Hodge*, pp. 81-158.
37. C. Hodge, *Systematic Theology*, I p.203
38. *ibid.* II p.90
39. C. Hodge, *Ephesians* p.180.
40. Hence Nietzsche's graphic 'God is dead' passage:
We have killed him—you and I. All of us are his murderers. But how have we done this? How were we able to drink up the sea? Who gave us the sponge to wipe away the entire horizon? What did we do when we unchained this earth from its sun? Whither is it moving now? Whither are we moving now? Away from all suns? Are we not plunging continually? backward, sideward, forward, in all directions? Is there any up or down left? Are we not straying as through an infinite nothing? Do we not feel the breath of empty space? Has it not become colder? Is not night and more night coming on all the while?
Die frohliche Wissenschaft, 125.

Julian W. Ward

1 The relationship between subsidiary awareness and focal knowledge

From the experiments of cognitive psychologists that identified the activity of subception in the act of perception Polanyi identified a systematic relationship between our subsidiary awareness and our focal knowledge. Following terminology borrowed from anatomy he called what we were aware of subsidiarily the 'proximal' and what we were aware of focally the 'distal' (TD, p. 10). The proximal is that of which we have 'from-awareness' and the distal is that of which we have 'focal awareness' ('The Creative Imagination', p. 86; 'Logic and Psychology', p. 31). These two components in the act of knowledge are related in four different ways: functionally, phenomenally, semantically and ontologically (TD, pp. 9-13; [1, pp. 62-72]).

1. The Functional Relation.

An object of knowledge is known by means of sensations. Psychological experiments have demonstrated that in some acts of knowing there are bodily responses which contribute to it and of which we are not aware, a faculty known as subception (TD, p. 9). The object known is focal, the means by which we know it is the subsidiary. Hence we can say that the functional relation between the two terms is as follows: through being aware in a non-explicit way of the subsidiary aspects of our knowledge, one integrates these aspects and attends to the resulting focal object of knowledge. These two components, the subsidiary and the focal, stand in a non-reciprocal 'from-to' relation. It is always the

proximal term, therefore, which we may be said to 'know' but be unable to 'tell' (TD, p. 10).

Examples indicating this relation between the tacit and the focal are:

1. The recognition of an individual human face. We rely on the particular features of the face in order to recognise it, but we do not attend focally to these features. Rather, they are the means through which we recognise the face. We attend from the features to the focal recognition of the face. There are many features of a face that we are unable to specify although we may know the face very well indeed and be able to recognise it without the slightest hesitancy (TD, p. 10).

2. The perception of a stereoscopic image through a stereoscope. Polanyi notes:

We are aware of the two stereo pictures in some peculiar non-focal way. We seem to look through these two pictures, or past them, while we look straight at their joint image. We are indeed aware of them only as guides to the image on which we focus our attention ('Logic and Psychology', p. 29).

Thus the two pictures are subsidiary or proximal to the distal or focal image that is seen in three dimensions. Yet the difference between the two images is so minute that when we compare them focally we can hardly see any difference. 'Even if we used powerful methods for measuring them, we would find them difficult to itemize' ('Logic and Psychology', p. 30). Yet our subsidiary awareness absorbs the differences and integrates them with no difficulty whatsoever into the three-dimensional image which is the focus of our attention.

2. The Phenomenal Relation

What is subsidiarily apprehended is transformed by our attention to the

object of focal awareness. In other words, what is apparent phenomenally in the proximal becomes different by virtue of its integration into the distal. Our phenomenal awareness of the subsidiary component, when it is subliminal, is derived entirely from the appearance of the focal object of attention (TD, p. 11). In the case of a face, the overall appearance contributes to the appearance of its individual features. We are aware of the features in terms of the overall facial appearance, i.e., the physiognomy. A nose that is isolated from its face will often not look the same to us as when it is part of the face.

3. The Semantic Relation

The combination of the functional and phenomenal relationships constitute the semantic (or meaning) relation between the subsidiary and the focal. The significance of the elements in the proximal is found by the way they act as signs for the distal and thus gain their meaning from the distal. Without the meaning that is imparted to them by the distal they would be meaningless. 'It is in terms of their meaning that they [the proximal signs] enter into the appearance of that to which we are attending from them' (TD, p. 11f). Meaning is always attained when a 'from-to' function exists in our awareness and so perception is always an act that bears a meaning for us. Examples of the semantic relation are found in the following:

1. The only meaning that the appearance of this nose has is that it is John's nose, but it has this meaning only as it enters into the appearance of John's face.

2. In a representative painting the brush strokes have meaning only in terms of the overall appearance of the painting. When viewed focally, they are in themselves meaningless.

They become the bearers of meaning when they are seen to form the composition of the painting. They are meaningful when the painting is seen through them and so it is the painting that is their meaning (M, pp. 86-92; 'What is a Painting?', *British Journal of Aesthetics*, Vol. 10, pp. 227-231, July 1970).

Prosch [1, p. 68] maintains that, for Polanyi, 'meaning' signifies 'signification' in the following two senses: (a) 'What has meaning, the proximal particulars, are always operating as clues or signs pointing to something else in an act of integration (an act of achieving meaning).' (b) 'What are integrated are always certain particulars that make some intelligible sense when integrated into a comprehensible form or pattern, and so are also significant in the sense of being important to an intelligence.' Prosch continues,

Meaning, in these senses therefore, is something that must be grasped or seen or created by a mind. It is not a mere equilibration of forces that happens to occur in a non-mind - say, in a computer. For Polanyi's "meaning" was not devoid of intention—the intention to find or achieve a meaning, i.e., the intention to find or achieve a comprehensive and intelligible integration Thus a meaning can only be pointed to by a mind as something existing in a mind. In fact, the meaning of the term "meaning", as Polanyi used it, can only be pointed to by a mind as something existing in a mind . . . "Meaning" is, therefore, really a triadic term in that, in addition to the functionally different proximal and distal factors, there must also always be a person, a user, an intender involved (p. 68f; cf. KB, pp. 181f, 185f, 'Logic and Psychology', p. 30f).

Thus this sense of 'meaning' as mind-dependent 'signification' appears to encompass both reference and use, i.e., the purpose intended determining the significance of that referred to.

That 'meaning' is validly mind-dependent has great importance for maintaining the reality of minds and their power to form objective

judgments. Prosch comments, 'This implication of tacit knowing has great consequences, as Polanyi claimed. This is so not only for the nature and status of the various knowledge enterprises of man, but also for the nature and status of man's grasp of himself and of others, and of his grasp of his and their place in a universe and in a society of persons. Which is to say, of course, that it has great consequences for the development of a comprehensive philosophical position' (p. 69).

4. The Ontological Relation.

From the functional, the phenomenal and the semantic relationships between the subsidiary and the focal awareness it is possible to derive an ontological relation between the proximal and the distal. Polanyi argues, 'Since tacit knowing establishes a meaningful relation between two terms, we may identify it with the understanding of the comprehensive entity which these two terms jointly constitute. Thus the proximal term represents the particulars of this entity, and we can say, accordingly, that we comprehend the entity by relying on our awareness of its particulars for attending to their joint meaning' (TD, p. 13). As the proximal and the distal components are both necessary to each other in an act of knowing, it follows that they must constitute an entity that comprehends both of them. Prosch explains:

This comprehensive entity must be the being (at least in the phenomenological sense) with which we have to deal in becoming aware of the functional, the phenomenal, and the semantic relations in which the two terms stand to each other. The two terms together constitute this entity. This must be true whether this entity finally turns out to be regarded as a creation of our own minds—following Kant and some of the contemporary existentialists—or a reality existing in itself with which our minds may

come into contact' (p. 70). Here Prosch allows that the ontological relation may be consistent with Kant's transcendental idealism, but later when he approves of Polanyi's definition of ontological reality it would seem that he wants to maintain that his epistemology is only consistent with a transcendent realism.

So for Polanyi what we perceive is perceived as a 'something-that-is-there', whether the perceptual experience be veridical or an illusion, a dream or a hallucination ('The Nature of Scientific Convictions', *Nineteenth Century*, 146, p. 18, July 1949). But when we claim that we have veridical perception we hold that we are perceiving something that is real and not a creation of our thinking processes. By 'real' Polanyi meant an entity that can be expected to exhibit itself in an indeterminate range of future manifestations. It will not only continue to affect our perceptions and our actions in the future but also to do so in unpredictable ways that will reveal further aspects of itself (TD, p. 32f; KB, pp. 119f, 135, 168; PK, p. 147). This is not the case with illusions, dreams or hallucinations. We do not regard our sense experiences as illusions until we begin to doubt whether they are experiences of something real. So Polanyi held that all cases of immediately experienced, sensible experience always produce ontological assertions of real entities, although we may come to doubt whether some of them are veridical.

2 The logic of achievement

Polanyi embarks upon the justification of an ontological hierarchy by specifying the logical levels evident in a machine. A machine is a contrivance that embodies its own operational principle (PK, pp. 176, 328) and thus the machine has a purpose. But many different machines of differing materials could

embody a single operational principle. It follows that *'the class of things defined by a common operational principle cannot be even approximately specified in terms of physics and chemistry'* (PK, p.329). The operational principle defines the correct functioning of a machine, but does not say anything concerning the possible failures of the machine.

The operational principles of machines are therefore *rules of rightness*, which account only for the successful working of machines but leave their failures entirely unexplained (PK, p.329).

The knowledge of physics and chemistry do not allow us to identify a machine as a machine. 'This result is crucial' (PK, p.330) in Polanyi's argument. *'The complete knowledge of a machine as [a physico-chemical] object tells us nothing about it as a machine'* (PK, p.330).

Knowledge of a machine as a machine comes not from physics and chemistry, but 'by understanding it technically; that is by participation in its purpose and an endorsement of its operational principles' (PK, p.330), which *'appreciates the machine as a rational means of securing the advantage in question'* (PK, p.329). In relation to the machine we have two types of knowledge: the technological and the scientific (i.e., physico-chemical). These two types of knowledge are in an asymmetrical relation: the technological knowledge establishes the machine as a comprehensive entity. The physico-chemical knowledge concerns the nature of its parts but cannot specify the function of the entity in question, although it may inform us of the processes involved in the functioning of the machine. 'Thus we will establish the material *conditions* under which the parts can fulfil their functions and which will explain their occasional failures' (PK, p.331). Any physical or chemical explanations for the failure of a machine only have significance inasmuch that they are re-

lated to the operational principles of the machine.

We may conclude quite generally that in our knowledge of a comprehensive entity [a machine or living creature], embodying a rule of rightness, any information supplied by physics and chemistry can play only a subsidiary part (PK, p.331).

Reasons can be given for each part of a machine and for the way they are linked in terms of the operational principles of a machine, whereas physical and chemical descriptions of the parts refer to *conditions* necessary for the proper functioning of the parts and the machine as a whole. Physics and chemistry may also state why a machine does not work, these reasons being related to the *conditions* required for successful operation of the machine.

Since rules of rightness cannot account for failures, and reasons for doing something can only be given within the context of rules of rightness, it follows that there can be no reasons (in this sense) for a failure. It is best, therefore, to avoid the use of the word 'reason' in this context and to describe the origins of failures invariably as their *causes*. We can say then that physico-chemical investigations of a machine, carried out with a bearing on its operational principles, can elucidate both the conditions for their success and the causes of their failure. It would be wrong to speak of establishing the physical and chemical 'causes' of success, for the success of a machine is defined by its operational principles, which are not specifiable in physico-chemical terms (PK, p.332).

Thus, in general, we have two logical levels embodied in a machine: firstly, the factual, i.e., physico-chemical states, that can be investigated by pure science; secondly, the teleological, i.e., the purpose of the machine that is expressed in its operational principles. Knowledge of its purpose is gained by indwelling the functioning of the parts that contribute to the operational principles of the

machine. This principle of two logical levels can be found in biological organisms inasmuch that they are at least biological machines and also in computers (PK, p.332f).

3 The logic of emergence and randomisation

Polanyi argues that the conceptual progression by which we know the emergence of a novel form of reality can occur in stages or by degrees, so that the novel form is not necessarily a new emergent existent. For it is our knowledge of an emergent form, rather than the emergent being as such, which is unspecifiable in terms of the lower level subsidiaries (PK, p. 393f). As examples of two distinguishable conceptual levels *not* implying two separate levels of existence which Polanyi refers to (PK, p. 394):

- (a) The regular pattern of small balls when placed in a pan.
- (b) The symmetry of crystals formed by the regular aggregation of their molecules.
- (c) Knowledge of chemical reactions, as determined by chemistry, is in principle predictable from a thorough knowledge of atomic physics.

But it can only be obtained from the experience of identifying and handling chemical substances. So whereas there is not 'a complete existential disjunction' between chemicals and atoms, knowledge of physics cannot supplant the knowledge of chemistry. So 'we may acknowledge this as [implying] an incipient separation of two forms of existence.'

Randomisation in the inanimate domain produces two sharply separated levels of existence and provides a fundamental example of emergence. We can know that we have a well shuffled pack of cards provided that we do not know how we have done it. If we did, we would know the arrangement of the cards and could not produce statis-

tical statements about the selection of a specified card. This is

a case of emergence, for we can know the randomness of a system, yet we cannot know it in terms of a more detailed knowledge of the system. Our knowledge of this emergent quality, randomness, is in fact destroyed by observing the particulars which determine the system below the emergent level. Moreover, randomness, as an emergent quality, offers a possibility for a new system of manipulations [as in statistics] (PK, p. 391).

For example, the comprehensive features of a gas, such as temperature or pressure, can only be specified if we assume that its molecules are in random motion. It is logically impossible to predict these comprehensive features from a supposed knowledge of the configuration of the positions and velocities of all the molecules of a gas, for this information would lead to only further information about the molecules. Polanyi finds corroboration for this in an examination of Boltzmann's equation for the entropy of a gas (PK, p. 391 n1). Polanyi finds further support for his view that randomisation is an unanalysable ultimate in the affirmations on this by the physicist N.C. Campbell in *Physics: The Elements*, p. 209, Cambridge, 1920 (PK, p. 390n2).

Polanyi's view that randomisation is an existential emergent is supported by K.R. Popper. In his Arthur Holly Compton Memorial Lecture *Of Clouds and Clocks* of 1965. Popper notes how Peirce, because of indeterminacies in all scientific measurements, conjectured that

the world was not only ruled by the *strict Newtonian laws*, but that it was also at the same time ruled by *laws of chance*, or of randomness, or of disorder: by laws of statistical *probability*².

So Popper maintains,

The interaction between atoms or between molecules has a *random* aspect, a *chance* aspect; "chance" not only in the Aristotelian sense in which

it is opposed to "purpose," but chance in the sense in which it is subject to the objective probabilistic theory of random events, rather than to anything like exact mechanical laws³.

Popper finds an example of such emergence in the half-life of radioactive isotopes.

It very much looks as if the *precise* value of the half-life of a nucleus would have to remain for ever an emergent property, a property unpredictable from the properties of its constituents⁴.

Popper finds another emergent property in the propensity of certain molecules to form crystals capable of reflecting light of a certain wavelength, namely, the emergence of coloured surfaces⁵. The behaviour of heat as described by the second law of thermodynamics can only be accomplished by reference to the concepts of molecular randomness and its average. There is no possibility of a complete reduction in explanation in terms of the interaction of individual atoms or molecules. 'Probabilistic conclusions require probabilistic and thus non-individualistic premises for their derivation'⁶. Moreover, temperature control of a gas has a 'downward causation' on the movements of its individual molecules, whereas a constant temperature can include increased velocities of some molecules, compensated by the decreased velocities of others. On this Popper comments,

This seems to me another important example of the general principle that a higher level may exert a dominant influence upon a lower level. The one-sided dominance is due, in this case at least, to the random character of the heat motion of the atoms . . . for it seems that, were the universe *per impossibile* a perfect determinist clockwork, there would be no heat production and no layers and therefore no such dominating influence would occur. This suggests that the emergence of hierarchical levels or layers, and of an interaction between them, depends on a fundamental indeterminism of the physical uni-

verse. Each level is open to causal influences coming from lower *and* from higher levels⁷.

Polanyi comments,

Many years of fruitless endeavour have proved that it is impossible to define the probabilities derived from the random character of a system by the microscopic details of the system [as in the study of the thermodynamics of gases]. This should encourage us to align randomness with other comprehensive features which are unspecifiable in terms of their particulars; and the analogy between these various cases will strengthen the concept of emergence as being that which they have in common (PK, p. 390).

Randomisation is a particular instance in which the logic of achievement coincides with the logic of emergence.

Randomisation may be unsuccessful; a trace of order may always remain undestroyed. In this sense randomness may be regarded as an achievement. In any case, as a comprehensive feature, randomness is subject to the logic of achievement. We can identify this logic here with the logic of emergence. The emergent form of existence is identified by our comprehensive judgment of it, which judgment accredits thereby, indirectly, a correlated context of properties, and of problems and manipulations, all of which presuppose the emergent form of existence and serve to elaborate its reality. This entire system . . . is unspecifiable in terms of its detailed particulars. But the particulars have a bearing on higher-level features. If the molecular motion of a gas is known to be random, we can evaluate from its particulars the temperature, pressure, entropy, etc, of the gas (PK, p.392).

4 The definition of reality

In 'The Unaccountable Element in Science' (1962) Polanyi defined external reality as follows:

We make sense of experience by relying on clues of which we are often aware only as pointers to their hidden meaning; this meaning is an aspect of reality which as such can

yet reveal itself in an indeterminate range of future discoveries. This is, in fact, my definition of external reality: reality is something that attracts our attention by clues which harass and beguile our minds into getting ever closer to it, and which, since it owes this attractive power to its independent existence, can always manifest itself in still unexpected ways. If we have grasped a true and deep-seated aspect of reality, then its future manifestations will be unexpected confirmations of our present knowledge of it. It is because of our anticipation of such hidden truths that scientific knowledge is accepted, and it is their presence in the body of accepted science that keeps it alive and at work in our minds. This is how accepted science serves as the premise of all further pursuit of scientific inquiry (KB, p. 119f).

Also in 1962 Polanyi wrote in 'Tacit Knowing: Its Bearing on Some Problems of Philosophy':

... we rely on our awareness of particulars for establishing the presence of a comprehensive entity. For this was viewed as something real, which being real, might be expected yet to manifest itself at some future time in unexpected ways. I have shown how this confirmed in its own way the common sense metaphysical belief that solid objects were something beyond the aggregate of their observed properties and that the mind is something beyond its overt manifestations; I have also shown that this conception of meaning reveals the thing that is named by the universal term. But it is still the course of scientific inquiry in which the metaphysical conception of reality beyond our tangible experience is written out most clearly, for all to see. From its very start, the inquiry assumes, and must assume, that there is something there to be discovered. The fascination, by which the inquiry can make progress, is fixed on discerning what it is that is there, and when discovery is achieved, it comes to us accredited by our conviction that its object was there all along, unrecognised. The rise, the path, the end, all point at the same reality and cannot but tell of it. Swearing by the existence of this reality, the scientist imposes on himself the discipline of his vocation.

And his sense of approaching nearer to reality is not exhausted by the consummation of discovery. It persists in the belief that what he has discovered is real, and being real, will yet mark its presence by an unlimited range of unsuspected implications. Deemed to be an aspect of reality, the new knowledge is believed to be fruitful and is claimed to be universally valid (KB, p. 172).

In a new introduction to *Science, Faith and Reality* written in 1963 Polanyi proposed his new definition of 'reality' in these words:

To hold a natural law to be true is to believe that its presence will manifest itself in an indeterminate range of yet unknown and perhaps yet unthinkable consequences. It is to regard the law as a real feature of nature which, as such, exists beyond our control. We meet here with a new definition of reality. Real is that which is expected to reveal itself indeterminately in the future. Hence an explicit statement can bear on reality only by virtue of the tacit coefficient associated with it. This conception of reality and of the tacit knowing of reality underlies all my writings (SFS, p. 10).

Polanyi regards reality as independent of our knowing and as characterised by having unforeseen consequences. His empirical and metaphysical realism is expressed as follows:

The implications of new knowledge can never be known at its birth. For it speaks of something real, and to attribute reality to something is to express the belief that its presence will yet show up in an indefinite number of unpredictable ways. An empirical statement is true to the extent to which it reveals an aspect of reality, a reality largely hidden to us, and *existing therefore independently of our knowing it*. By trying to say something that is true about a reality believed to be existing independently of our knowing it, all assertions of fact necessarily carry *universal intent*. *Our claim to speak of reality serves thus as the external anchoring of our commitment in making a factual statement* (PK, p.311).

In order to justify our common sense claims to knowledge of the realities evident in living creatures, including men, Polanyi uses the following key argument:

Our comprehension of a living individual entails a subsidiary awareness of its parts which is not wholly specifiable in more detached terms. This understanding acknowledges a particular comprehensive—i.e., 'molar'—achievement of the individual itself. Since our knowledge of this molar function is not specifiable in 'molecular' terms, the function itself is not reducible to molecular particulars; it must be acknowledged as a higher form of being, not determined by these particulars. We can reach this conclusion directly by recalling that the understanding of a whole appreciates the coherence of its subject matter and thus acknowledges the existence of a value that is absent from the constituent particulars (PK, p.327).

The noosphere, a term coined by Teilhard de Chardin to refer to the realms of art and science created by man, includes the humanities and the human and natural sciences but not the natural world to which the natural sciences refer. The realms of language, politics, law, economics, poetry, art and music are spheres containing man's creations. These creations are, nevertheless, realities because their structures are rich enough to exhibit in the future a presently indeterminate range manifestations. As creations of man they do not have the same form of reality as those aspects of the natural world with which the sciences are concerned, for their realities exist independently of man. The truth about natural realities is achieved by the processes of verification. But the truth of what man has created is confirmed by what Polanyi called 'validity'. Scientific theories can therefore be called 'valid' because the realities to which they refer have been verified, but the validation of other creations of man cannot undertaken in this way ('On the Modern Mind', p. 20; 'The Creative Imagination', p. 92; PK, p.

201f; TD, pp. 76-79; M, pp. 66f, 101f, 104, 194f). Both our beliefs about natural realities and our beliefs about noospheric realities are held with 'universal intent', that is, we hold them to be true and believe that other competent persons in possession of the same experiences as ourselves should also acknowledge these beliefs to be true (TD, pp. 69, 77ff; M, p. 194f).

The degree of significance or meaning that something has depends on the possible range of future manifestations that it could convey. Thus, for Polanyi, there could be degrees of reality in conformity with his theory of ontological hierarchies. Thus Polanyi opposed modern notions that the creations of man are merely epiphenomenal or illusory and maintained that they have true reality. In fact, he claimed that a cobblestone was less real than a mind or a problem, because a stone will manifest a much narrower range of characteristics in the future than a mind or a problem. The creations of minds do not lack reality just because they are not tangible (KB, pp. 135f, 151, 168; TD, p. 32f).

For Polanyi a theory that manifests unforeseen consequences can be called 'true'. Most such consequences are discovered by experiments, but sometimes they are evident in further theoretical implications. Polanyi's belief that both scientific theories and works of art are real can be compared with Popper's World 3 objects. But whereas the latter are viewed by Popper as impersonal, for Polanyi such realities are mind-dependent, albeit with an intersubjective validity. Polanyi's theory of the degrees of reality present in nature is an updated Augustinianism and Thomism, which equated being and goodness in a natural hierarchy, in which higher levels manifest more reality and more being than the lower levels.

5 Ontological hierarchies

It is the correspondence between the tacit factors in our explicit knowledge and the structure of reality that makes possible Polanyi's belief in ontological hierarchies. Because of the logical relation between tacit knowledge and our focal awareness, the ontological entity of which we are aware must ontologically include elements that are the source of the tacit components in our knowledge. Hence Polanyi called the object of our focal awareness a 'comprehensive entity', which will thus contain those elements of which we are focally aware and those of which we are only subsidiarily aware.

Polanyi opposed reductionism by showing that a machine is constructed so that the relations between its parts embodies the purpose of the machine. We cannot grasp that purpose by merely looking at the components parts of a machine. Often when we look at the part of a machine that we do not know the part seems meaningless to us. We can only apprehend the purpose of the machine by attending from its purpose to the overall structure which thereby conveys to us the purpose of the machine. Whereas the laws of physics and chemistry may suffice for explaining the characteristics of the parts of a machine, they cannot explain the purpose of the machine.

A comprehensive entity is constituted in its being by the integration of its parts but the character of its whole, namely, its principles of operation as a whole, is not deducible from its constituents. Since these parts and wholes form an ascending series, an ontological hierarchy is generated by them. The fact of ontological hierarchies is not only confirmed by our experience of the world and human life and implicit in the range of the sciences, but it is also logically entailed by Polanyi's epistemology ('Science and Man's Place in the Universe', p. 20; KB, p. 154; TD, pp. 33ff, 41, 55; M, pp. 50, 176).

Each comprehensive entity which cannot be reduced to a lower level in the hierarchy is a reality, and thus each level in the hierarchy is a sphere of reality.

Polanyi emphasises how tacit knowing gives us knowledge of living things:

But something even more vital follows from formulating tacit knowing as an act of indwelling. It deepens our knowledge of living things . . . We therefore recognise and study the coherence of living things by integrating their motions—and any other normal changes occurring in their parts—into our comprehension of their functions. *We integrate mentally what living beings integrate practically.* ('Logic and Psychology', p. 34).

The range of ontological hierarchies is particularly manifest when we consider man, because, in order to understand his multifarious activities, one assumes boundary principles that delineate lower levels in the hierarchy (SOM, p. 59; 'Transcendence and Self-Transcendence', *Soundings*, Vol. 53, Spring 1970, p. 91; PK, pp. 385f; KB, p. 236f; TD, p. 50f):

- (a) As a biological organism the principles of being a living thing provide boundary conditions for the physical and chemical processes that are essential to his make-up. The vegetative boundary system leaves open the possibility of movement by muscular action, but it is not rich enough to establish it.
- (b) Unlike plants, man can move himself by muscular activity and the principles required for this leave open the possibility of innate patterns of behaviour, but do not establish any.
- (c) Man, like many other creatures, has instincts, sentience and innate patterns of behaviour, that act as a boundary principles for his biological and muscular activity.
- (d) Like other animals, man has a sense of individuality that operates as a boundary for his instincts, sentience and innate patterns of behaviour. Thus at this

level mind can be regarded as a reality.

(e) This sense of individuality is further bounded by social principles, since man is a gregarious animal.

(f) This sociability is given a further, higher boundary by intelligence and language.

(g) This capacity is given further bounds by his linguistic and creative forms of life in science, law, poetry, etc. At this level the noosphere becomes a reality.

(h) Man's intellectual and creative powers make possible but do not necessitate higher levels in morality and religion (PK, pp. 385-390; KB, p. 135; TD, p. 41).

At this level the principles of truth, beauty and morality arise as principles that should guide his behaviour and the whole noosphere is a 'firmament of obligations'. These are spheres of reality with a structure and thrust of their own and we find ourselves subject to their intrinsic standards, just as we are in mathematics. From the logic of achievement Polanyi argues,

Whatever rules of rightness a person tries to fulfil and establish—he they moral, aesthetic or legal—he commits himself to an ideal [apprehended as a transcendent reality]; and again he can only do so within a medium [i.e., psychological processes] that is blind to this ideal. The ideal determines the standards to which a person holds himself responsible; but the ideal-blind medium both grants the possibility for striving for this ideal and limits this possibility. It determines his calling (PK, p. 334).

Polanyi deems such ideal values 'transcendent' (PK, p. 183) and so 'our personhood is assured by our simultaneous contact with universal aspirations which place us in a transcendent perspective' (PK, p. 324).

At each level of a hierarchy its natural laws or operational principles govern the interactions of its elements, but in doing so leave open and unconditioned its range of operation at its level. This is determined by the operations of the next

higher level which imposes limitations upon the possible range of operation. Polanyi calls these limitations boundary conditions which are thus set by the next higher level. Hence he says that, as two levels at least are involved in activities at the lower level, this is a system of dual control. The determination of the boundary conditions of one level by the operational principles of the next higher level is called the principle of marginal control (TD, pp. 34-40; SM Lecture 2; Prosch, p. 131).

Polanyi's doctrine of the knowledge of hierarchical structures argues that there is an analogical relationship between the structure of the higher and lower levels and the structure of our tacit knowledge in which we indwell and integrate proximate subsidiaries in order to gain a knowledge of a higher level. Just as we indwell our bodies, animating them for purposeful activities, so we indwell our tacit knowledge of an entity in a purposeful manner in order to achieve an understanding of the significance of those tacitly apprehended factors which constitutes the knowledge of an entity or reality. Moreover, it could be argued that man actually lives as a hierarchical structure, as a physical, chemical, biological, sentient, psychological, social, linguistic, intelligent, aesthetic, moral and spiritual being, so that in tacit knowing he integrates aspects of all these levels such that knowing itself constitutes a hierarchy that is analogical to the entity that is grasped through it (Prosch, p. 133f).

Language is a hierarchical organisation on the five levels of producing sounds, words, sentences, style and composition. Each level is governed by its own laws, namely, phonetics, lexicography, grammar, stylistics and literary criticism. Words are constituted by boundary conditions or principles that harness or organise sounds. In this way words set a limit to the sounds that are uttered. Words require sounds in order to exist, but the principles involved in sound

production cannot produce words with meanings, just as the principles of a propositional calculus cannot produce an arithmetic. It is the vocabulary of a language which determines which sounds are uttered. Likewise, grammatical principles in turn set boundary conditions for the usage and inflection of words and enable us to form sentences. A style of language then places boundaries on sentences in the impartation of meaning and verbal communication is bounded by the ultimate principles of an intended communication ('On the Modern Mind', p. 14f; 'Science and Man's Place in the Universe', p. 70f; 'Life Transcending Physics and Chemistry', p. 59; PK, p. 382; KB, p. 238; M, pp. 49ff).

Polanyi thinks that all the levels of reality in his ontological hierarchy should be included in the science of biology as it is the study of life, and, in man, life includes all these levels:

As we proceed to survey the ascending stages of life, our subject matter will tend to include more and more of the very faculties on which we rely for understanding it. We realise then that what we observe about the capacities of living beings must be consonant with our reliance on the same kind of capacities for observing it. Biology is life reflecting on itself, and the findings of biology must prove consistent with the claims made by biology for its own findings.

And as we shall find ourselves accrediting living beings with a wide range of faculties, similar to those which we have claimed for ourselves in the foregoing enquiry into the nature and justification of knowledge, we shall see that biology is an expansion of the theory of knowledge into a theory of all kinds of biotic achievements, among which the acquisition of knowledge is one. These will all be comprised by a generalised conception of commitment. The critique of biology will then turn out to be an analysis of the biologist's commitment, by which he accredits the realities on which living beings rely in the stratagem of living. And while these realities will fall into line

with the realities to which our knowledge of inanimate things commits us, another line of generalisation, ascending from the I-It to the I-Thou and beyond it to the study of human greatness, will transform the biologist's relation to his subject matter to that between man and the abiding firmament which he is committed to serve (PK, p. 347f).

Polanyi thus argues that as the study of life includes all aspects of reality that are relevant to man and as the biologist has a personal participation in his subject matter, such that it must then encompass his own knowing, then the science of biology could be extended to include epistemology and ontology. This extension of an ascending series of biological observations into the domain of human knowing, life and comprehension is called 'ultra-biology' by Polanyi; (PK, pp. 377, 386f, 404). This correlation of traditional philosophical concerns with biology is not inconsistent with Polanyi's own avowal that the scientist can arrive at valid results even if his philosophical commitments are false. But Polanyi's ontological hierarchy would deny the possibility of philosophical and moral issues being determined by science. What he calls here the 'science of biology' in fact includes epistemology and metaphysics.

The ontological levels in the being of man enable him to far exceed the capacities of other animals and to succeed or fail in social and intellectual spheres that are inapplicable to them, although some of his failures in these endeavours may be due, like theirs, merely to errors, disease, etc. But man also is unique in being subject to an even higher level of reality in morality whose boundary conditions result in obligations in his multifaceted forms of life in the various language-based activities. Thus, unlike the animals, man has the capacity to do evil in violating his obligations to responsible conduct in these varied aspects of his life. Moral conduct thus transcends

all the other levels in the ontological hierarchy, although like them it is dependent for its reality upon the reality of the lower levels in the hierarchy.

The principles of truth, beauty and morality are realities that create obligations binding upon us and thus are the source of principles by which we should direct our lives. But modern reductionist thought regards them as extensions of lower levels of thought, such as, in Marxism, drives for power or profit, upon which, it is true, they do rest existentially. Other modern humanist thought likewise maintains that our concepts of truth, beauty and justice are extensions of psychological or sociological forces (PK, pp. 379-382, 386). Polanyi hoped that his new epistemology and its associated ontological hierarchy would recreate faith in these 'spiritual entities' and therefore justify for modern man the validity of the integrations created in science, poetry, art, morality and religion.

By virtue of the tacit components in knowledge all true knowledge involves the personal participation of the knower in his knowledge and is thus 'personal knowledge'. Polanyi thus hoped that the adoption of his hierarchical view of reality would allow us once again to believe in traditional values without fearing that we were losing our intellectual integrity. In this way modern moral inversions and nihilisms could be answered and the sanity of Western civilisation preserved ('Sixty Years in Universities', pp. 3-6; LL, pp. 97-110; PK, pp. 229ff, 237-240; M, pp. 12-28, 106f).

Polanyi recognised that it was consistent with his epistemology to maintain that there could be no final demonstration of the truth of any world-view, including his own. He accepted the metaphysical application of Godel's theorems that maintain that there can be no demonstration of the consistency of a system within the system. No world-view can conclusively demand assent. Belief in it is always

based on personal, tacit components and values that are extraneous to what is consciously held. It can only claim to show that it has a more comprehensive and meaningful interpretation of all of experience than its rivals. This is what Polanyi claimed for his ontological hierarchy as confirmed by his phenomenology of human cognition. Conversion from one world-view to another can occur when a person sees that a new world-view would seem to open many more possibilities for a richer field of meaning than the one he previously held. Polanyi claimed to have made more sense of human experience than the modern reductionistic world-views and, in his own terms, could claim that his world-view was true. If we allow that the common sense values by which we live are valid, then we must concur with his conclusion.

6 Polanyi's argument for three logical levels in living organisms

Polanyi argues that there are three logical levels in organisms (PK, pp.341-343):

1. The physico-chemical level.
2. Machine-like functions with their own operational principles that can be defined in precise terms. Comprehension of success comes from analysis of the organism's functions. These functions are called 'structural principles' in 'The Structure of Consciousness' (1965, KB, p. 219).
3. Purposive regulation (interwoven with the machine-like functions) that controls the overall performance of the organism.

Regulation is an equipotential integration of all parts of the organism expressible only in gestalt-like terms. Appraisal of the success of regulation is a skilful personal knowing. Also at this level are the workings of morphogenetic fields in embryonic development, i.e., ontogeny. The principles of these fields have been described by C.H. Waddington in his concept of

'epigenetic landscapes' controlling embryonic growth. Polanyi called these fields 'organising fields' and 'organismic principles' in 'The Structure of Consciousness' (KB, p. 219).

Polanyi wishes to argue against the reductionist view, commonly held by biologists, that morphogenesis (in ontogeny and regeneration) and an organism's behaviour can be explained entirely in terms of physico-chemical equilibrations. Polanyi makes the following points:

1. Where science and technology overlap, the operational principles of the latter overlap certain laws of nature (PK, p.331). 'Yet both in the case of technology and physiology something is being achieved which neither physics nor chemistry can define' (PK, p.342), namely, a performance to which the adjectives 'right' or 'wrong' can properly be attached.
2. Just as a sensory awareness of a gestalt may be right or wrong, leading to knowledge or illusion, so a morphogenesis may succeed or fail. But a physico-chemical explanation cannot of itself express success or failure, but only factuality.
3. Both in psychology and biology we have an intrinsic interest in their topics for their own sake, in which physics and chemistry are subordinated to these interests. In other words, physical and chemical knowledge about an organism is only meaningful if we have previously identified the organism as a comprehensive entity. 'A complete physical and chemical topography of a frog would tell us nothing about it *as a frog*, unless we knew it previously as a frog' (PK, p.342). So it has to be maintained that the entities of psychology and morphogenesis are in principle unspecifiable in terms of physics and chemistry (cf. PK, p.358).

These considerations of achievement and of ontology lead Polanyi to his conclusion:

Living beings function according to two always interwoven principles,

namely as machines and by regulation. Machine-like functions operate ideally by fixed structures; the ideal case of regulation is equipotential integration of all parts in a joint performance. Both kinds of performances are defined by rules of rightness and these refer in either case to a comprehensive biotic entity. But there is this difference. Machine-like functions are ideally defined by precise operational principles, while the rightness of a regulative achievement can be expressed only in gestalt-like terms. One's comprehension of a machine is, accordingly, analytic, while one's appraisal of regulation is a purely skilful knowing, a connoisseurship. Yet both kinds of performances have it in common that their rightness cannot be specified in the more impersonal terms of physics and chemistry (PK, p.342f).

7 Living creatures as biological machines

One of Polanyi's arguments for this level is partly derived from a prior argument for a level of inventive sentience in animals (see next section). *A fortiori*, if that be true, then it is not hard to accredit a lower level of animals as biological machines (cf. PK, Ch. 11, p.402).

The logic of physiology (PK, p.359f) conforms to the logic of machines (cf. PK, 175f, 342) in that organs and tissues embody teleological operational principles that relate to the overall functioning of the organism. As with a machine a complete physico-chemical specification of an organ would fail to include a statement of its purpose and indeed would obscure its identification (PK, p.359, cf PK, p.342, 358, 360). But the personal knowledge of the purpose and satisfactory operation of an organ involves more connoisseurship than that involved in comprehending the operation of a machine.

Thus in physiology, the twofold unspecifiability of organised shapes and of the processes occurring within them is added to the inherent unspecifiability attached to operational

principles in general, and to this extent the logic of physiology differs from that of engineering' (PK, p.359f).

Just as machines, as machines, are the embodiment of an operational principle and therefore exist as teleological entities distinct from the mere aggregation of their parts, so organs are the embodiment of teleological operational principles. As the result of emergent evolution we can also call these ordering principles.

A machine-like function is characterised by its operational principle, which cannot be defined in terms of physics and chemistry, and consequently the rise of new operational principles in living things cannot be defined either in terms of physics and chemistry. In so far, therefore, as an organism sustains itself by functioning as a machine, it is the embodiment of an ordering principle that cannot be defined in terms of physics and chemistry. Random impacts can *release* the functions of an ordering principle and suitable physico-chemical conditions can *sustain* its continued operation; but the *action* which *generates* the embodiment of a novel ordering principle always lies in this principle itself (PK, p.401).

Thus, as a possible coherent operation of nature, the ordering principle initiates its own embodiment. Hence the ordering principle of an organ is self-generating.

8 Animals as centres of sentience and originality

Polanyi sought to answer the question whether animals had active centres of decision or were no more than biological machines (PK, p.335). Whereas 'the machine-like conception of living beings can be extended in principle to account for their adaptive capacities' (PK, p.336), Polanyi sought to argue that this could not be adequate or convincing because, firstly, present knowledge of physics and chemistry contains no explanation for the origin of sentience.

Secondly, he noted the evidence for learning, assessment and decision making in rats as well as the inventive powers of apes in the solution of problems (PK, p.74). Moreover, rats who had learned a maze and whose neural paths used in learning had been cut could still negotiate the maze by different operations in movement. Polanyi labelled this capacity for reorganising operating powers to achieve the same purpose 'equipotentiality' (PK, p.337). Both paralysed people and amputated insects show a capacity for such reorganisation, which shows 'a capacity of the nervous system to reorganise itself adaptively' (PK, p.338). Likewise, cells taken from embryos can grow into part of an embryo, or even a whole one in the case of the sea urchin (PK, p.338). Thirdly, if we suppose that mental thought processes are an epiphenomenon rooted in physico-chemical processes and with no active effect on them, we have to conclude that Shakespeare's conscious thoughts had no effect on the writings of his plays, whereas submission to the authority of a genius implies the presence of purposive originality in him. Fourthly, we accept other human beings as responsible persons, like ourselves, and as ones who claim universal validity for their knowledge claims (PK, p.263-4, 312).

Having argued for true originality in man being rooted in tacit coefficients which account for all the powers of articulate intelligence (PK, Ch. 8 'The Logic of Affirmation'), Polanyi argues on the grounds of continuity that similar tacit powers produce originality and purpose in animals. Polanyi thus maintains,

There are then two principles at work in animals: namely, (1) the use of machine-like contrivances and (2) the inventive powers of animal life. Accordingly, while the animal's machinery embodies fixed operational principles, this machinery would be impelled, guided and readapted by the animal's inventive urge (PK, p.337).

Polanyi says, 'I believe that the unformalisable regulative functions, linked to the animal's mental processes, are the predominant, comprehensive agency of animal life' (p.401). The new features added on to the characteristics of vegetative life at the active-perceptive level are:

sentience of motive and knowledge; an effort to *do right* and *know truly*; a belief that there exists an independent reality which makes these endeavours meaningful, and a sense for the consequent *hazards* (PK, p.363).

A living individual strikes us as a personal fact, having a much more tangible and active being than any other personal [inorganic] fact that we have yet encountered . . . Its meaning is different, perhaps richer, and above all, it has a *centre*. The focus of our comprehension is now something active, that grows, produces meaningful shapes, survives by the rational functioning of its organs; something that can behave and acquire knowledge, and at a human level, can even think and affirm its own convictions' (PK, p.343f).

Polanyi continues,

The acknowledgement of such a centre is a logical novelty, as is evidenced in our assessment of another person's knowledge, which points to the irreducibility of his personhood as an active centre.

9 Criticisms of reductionism

The current attempts to explain organisms entirely in terms of the laws of physics and chemistry, with which most modern biologists concur, either results in or flows from the metaphysical belief that living things are no more than physical and chemical operations. Watson and Crick were typical in their belief that their discovery of the structure of DNA would inevitably lead to the reduction of living things to physical and chemical processes. But this not only tended to the modern lack of respect for living beings, and human life in particular, but it was actually false.

Polanyi's principal point is that physico-chemical activity exists on a different logical level to the teleological biological operations of an organism which imposes boundary conditions on the physico-chemical action. He writes,

The conception of such a [biological/morphogenetic] field is of course finalistic. It attributes to certain achievements—whether self-centred or aiming at universality—the power to promote their own realisation. Scientists will not be prepared to even consider such a suggestion, unless they have completely accepted the fact that biotic achievements cannot—*logically cannot*—be ever represented in terms of physics and chemistry; and very few do realise this' (PK, p. 399, cf. M, pp. 165-168).

Reductionist explanations offer pseudo-substitutions for a level of reality and its principles which they aim to explain away. In fact they use their grasp of subsidiaries at a lower level in order to apprehend the realities that they wish to reduce. They then use terms like the 'simplicity' or 'predictive convenience' of scientific theories to mask the fact that a realm of truth is revealed in these theories (PK, pp. 16, 147, 166, 169f).

Polanyi characterises the effects of reductionism in this way:

Then law is no more than what the courts will decide, art but an emollient of nerves, morality but a convention, tradition but an inertia, God but a psychological necessity. Then man dominates the world in which he himself does not exist. For with his obligations he has lost his voice and his hope, and has been left behind meaningless to himself (PK, p. 380, cf. W.H. Poteat: *Polanyian Meditations*, p. 234).

There are important gaps in reductionistic explanations and there seems little likelihood of adequate explanations being provided:

- (a) There is no adequate physical or chemical explanation for the origin and growth of DNA chains. Calculations of the statistical

probability of this occurring by chance have shown that this is so exceedingly unlikely that such an explanation can be dismissed as virtually impossible (M, p. 165).

(b) There is no chemical explanation for the capacity of DNA to produce cellular activity that anticipates a future stage in the development of embryos. Successful embryological development requires the DNA molecule to produce cells that will then cause it to produce further cells that will then in turn cause the DNA molecule to produce the next stage of development.

A given DNA molecule guides the successive stages of embryonic development: each stage produces a cellular milieu which will in turn guide this DNA in producing a further cellular milieu for very *different* actions of this same DNA—those which have to follow next in order to complete the proper development of the embryo. The *same* DNA particle, in other words, acts differently at different times in the different stages of the development of the embryo Timing therefore is most important. No theory yet exists to explain how this can be done in a strictly chemical way.

Physical and chemical causation cannot explain the teleological orientation of both DNA and the cells it produces (M, p. 165f).

The difficulty of providing such an explanation is shown by the experiments of Driesch on sea-urchin embryos in which cells could be induced to make abnormal corrective changes when a part of the embryo was prevented from developing in the usual way. The organism behaves as though it knew what it was to become. Polanyi concludes,

All these considerations point to one of two conclusions: either the DNA is at once the blueprint and the builder (it is a sort of 'master molecule', and it makes adaptations in some kind of purposeful way), or else it functions as merely another 'organ' in the body and so is interrelated in an immensely complicated way with every other

organ (and *cell*) in adapting itself to the needs of that organism for growth and maintenance (M, p. 167).

Since Polanyi's time gene switches have been identified in DNA and also the growth of the embryo has been seen to be controlled also by morphogenetic fields. Thus there is truth in both of Polanyi's alternatives.

But Polanyi thinks that it is not possible in principle to be sure of reducing the processes of embryonic development to physical and chemical activities. For where a new development occurs in evolutionary development we cannot be sure whether this is the result of a new creative process or the expression of pre-existing powers that were not previously activated.

Furthermore, there is no available chemical explanation for the vast growth of DNA chains from twenty million sequences in bacteria to twelve billion in man. Moreover, reductionism has to assume that great works of art, such as Beethoven's Ninth Symphony and Shakespeare's *Hamlet*, are no more than the product of atomic forces. But no-one thinks of trying to produce an explanation for them in these terms because of the practical impossibility of doing so. One might add that any attempted explanation would also have to be seen as the product of impersonal and necessary atomic forces and could not be regarded as resulting from free and purposive choice. We would then have no grounds for asserting its truth, for such assertions would likewise be mere products of impersonal necessity.

Reductionism assumes that organisms can be treated as mechanisms. Polanyi is in agreement with this as a working principle and allows that this assumption has facilitated considerable scientific advance in the understanding of organisms. But reductionism makes the further assumption that organisms are fully explicable in terms of physical and chemical laws. Polanyi here objects that this is not true of mechanisms, and, *a fortiori*,

ori, is not therefore true of organisms ('Life Transcending Physics and Chemistry', p. 65f; KB, p. 232; TD, p. 41f; M, p. 168).

Many scientists hold to the Laplacean ideal that a full and complete atomic science combined with a map of the atomic topography of the universe, with allowances for quantum mechanical ranges of probabilities, would allow us to calculate any past or future state of affairs in any region of the universe. For Polanyi such mechanistic determinism is at the heart of the philosophical fallacies of reductionism that are derived from a wrong view of the objectivity of science. But, he maintained, such a grandiose world view, even if achievable, would tell us nothing that we should be interested in. If we were investigating primroses or frogs a complete description of the location of atomic particles would be useless unless we were able also to identify the physiognomies of primroses and frogs. Only if we have the means to identify primroses and frogs would we be able to identify any particular concatenation of atoms as belonging to them. Moreover, to know when primroses will bloom or frogs will croak we would need to know the principles of the operation of these creatures, namely, the conditions related to their boundary conditions as individual organisms which partially determine what their atoms will do. But such knowledge of the operation of living organisms can only come from a direct study of their behaviour, quite often regardless of whether or not we know what their atoms are doing ('Study of Man', p. 28f; PK, p. 342; KB, p. 178f; TD, p. 20).

Polanyi sought to oppose the attempt to maintain that organisms can, unlike machines, be explained as the result of purely physical and chemical laws by pointing out that:

(a) The reductionist gratuitously assumes that scientific explanations will eventually be able to provide solely physical and chemical explanations for living

beings. But he has no adequate evidence or justifiable grounds for this assumption.

(b) Biologists do not actually treat organisms as mere mechanisms but distinguish them from inanimate dynamic systems such as flames and thunderstorms:

(i) Organs are considered in relation to the functioning of the organism as a whole.

(ii) Biologists tacitly ascribe the notion of achievement to organisms which are seen to be centres of teleological activity.

(iii) The science of pathology is essential to biology and pathology assumes the possible failure of organisms, due to disease, etc., whereas the notion of achievement or failure does not even arise in meteorology. Organisms can fail in numberless ways due to malfunctioning or disease, and if we do not know the causes of their failures we do not know all there is to know about them ('Life Transcending Physics and Chemistry', p. 65f; 'Logic and Psychology', p. 34f; 'Science and Man's Place in the Universe', p. 68; PK, pp. 328-344; SM, p. 53f; KB, p. 227f; TD, pp. 44, 50f; M, pp. 169ff; C.F.A. Pantin: *The Relations between the Sciences*, pp. 35-45, 53, 74, 124, 140f, Cambridge, 1968). The concept of achievement is therefore essential to biology, but not to physics or chemistry.

Hydrochloric acid can never fail to dissolve zinc. Nor can it dissolve platinum by mistake. Only living things can make mistakes (PK, p. 389; cf. M, p. 170).

Thus biologists are not in practice reductionist and, in view of their assumptions that cells, organs, instincts, etc., have purposes that relate to the operations of the whole organism, they cannot be reductionists and remain biologists.

(c) It is logically impossible for DNA to act as a code if it is the mere result of chemical laws.

In order for a physical medium to be the bearer of a message, the physical and chemical activities of the medium must not interfere or affect the message. When they do so they create 'noise' that tends to obscure the message. Print on a page could not convey its information if the ink reacted with the paper such that the letters became indistinct. Conversely, if rocks had a disposition to roll down hillsides such that they formed shapes spelling the names of towns, we would be unable to use rocks to spell out the name of a town on a railway embankment ('Life Transcending Physics and Chemistry', pp. 62; PK, pp. 34-40; KB, pp. 108f, 228f; M, p. 171). Likewise, if the sequence in a DNA chain were the product merely of chemical reactions it could not serve as the bearer of a teleological code that determines the biological form and function of an organism. It is just because DNA is not merely the result of chemical reactions that it can function as a code that organises the chemicals. Polanyi noted that DNA is not an ideal medium for bearing a code intended to organise chemical operations as its four organic bases do not have a perfectly equal chemical probability of forming any of the four and so there is inevitably some resulting redundancy, but this redundancy is not sufficient to prevent DNA from functioning as a code ('Life Transcending Physics and Chemistry', p. 62; 'Science and Man', p. 970f; KB, p. 228; M, p. 171).

(d) Modern reductionism, in seeking to explain organisms entirely in terms of physical and chemical processes, has no option but to maintain that chance is the originator of DNA codes. But the probability that DNA molecules had acquired their coding character by chance is much less than the likelihood that piles of rocks have rolled down hillsides to form the English names of the

towns where they are located (M, p. 172).

Polanyi thus concluded that it is a fact that DNA and every organism structured by it are meaningful organisations of essentially meaningless matter. In contrast with the structures and behaviour of inanimate molecules and bodies, living beings are meaningful to us as distinct entities in two ways:

(a) Their structure forms a coherent and corporate whole in which the parts gain their true significance in terms of their contribution to the whole.

(b) Their behaviour can only be fully understood in terms of their activity as corporate wholes and they can succeed in expressing the potentialities of their natures or they can fail to do so.

Such achievement, or failure to do so, can only be meaningfully described if one accepts, as biologists implicitly do, that living beings are distinct modes of reality in addition to the physical and chemical processes that comprise some of their attributes.

10 Emergent evolution as a clue to God

Polanyi's epistemology led him to assert the ontology of commitment in which man exercises his judgment with universal intent under a sense of responsibility to a truth, beauty and goodness that transcend him.

The assumption that the world has some meaning which is linked to our own calling as the only morally responsible beings in the world, is an important example of the supernatural aspect of experience which Christian interpretations of the universe explore and develop. In chapter 13, I shall show how we can arrive by continuous stages from the scientific study of evolution to its interpretation as a clue to God (PK, p.285).

Our personhood is assured by our simultaneous contact with universal aspirations which place us in a transcendent perspective . . . We undertake the task of attaining to the

universal in spite of our admitted infirmity, which should render the task hopeless, because we hope to be visited by powers for which we cannot account in terms of our specific capabilities. This hope [of the grace of the Spirit] is a clue to God, which I shall trace further in my last chapter, by reflecting on the course of evolution (PK, p.324).

Polanyi envisages all living creatures as centres of striving in the phylogenetic process towards the ultimate liberation in which man now participates.

We may envisage then a cosmic field which called forth all these creatures by offering them a short-lived, limited, hazardous opportunity for making some progress of their own towards an unthinkable consummation (PK, p.405).

I do not think that, in context, Polanyi is referring to some scientific general unified theory when speaking of a cosmic field. I believe that he is speaking of a divine creativity sustaining the universe and active within it, directing it to its appointed destiny. Presumably Polanyi thinks that the natural phylogenetic fields are grounded in the divine cosmic field.

But Polanyi has a reticence towards the attempts of natural theology to prove the existence of God:

Theological attempts to prove the existence of God are as absurd as philosophical attempts to prove the premisses of mathematics or the principles of empirical inference (PK, p.281f).

Today we should be grateful for the prolonged attacks made by rationalists on religion for forcing us to renew the grounds of the Christian faith (PK, p.286).

As Saint Augustine viewed it, a religious belief cannot be achieved by our deliberate efforts and choice. It is a gift of God and may remain inexplicably denied to some of us' (M, p. 180).

Nevertheless, 'observation may supply us with rich clues for our belief in God' (PK, p.284).

Polanyi appears to have four 'clues to God':

1. The 'astounding' fact (PK, p.400) of evolutionary phylogenetic emergence. This may be taken as a specific application of the anthropic cosmological principle, namely, that the fine tuning of unrelated physical constants required for an ordered universe to be possible is only explicable in terms of a Creator God. Likewise, the universe is so structured that one part not only comes to life in a huge variety of creatures but also includes self-conscious, responsible persons.

2. Polanyi's doctrines of an emergent ontological hierarchy and man's indwelling of the artifacts of his culture makes it justifiable to claim that

everything we know is full of meaning, is not absurd at all, although we sometimes fail to grasp these meanings and fall into absurdities . . . we can claim all this with an open and clear scientific conscience. The religious hypothesis, if it does indeed hold that the world is meaningful rather than absurd, is therefore a viable hypothesis for us. There is no scientific reason why we cannot believe it (M, p. 179).

Polanyi concluded his Terry Lectures at Yale University in 1962 with these words:

I have tried to affiliate our creative endeavors to the organic evolution from which we have arisen. This cosmic emergence of meaning is inspiring . . . Men need a purpose which bears on eternity. Truth does that; our ideals do it; and this might be enough, if we could ever be satisfied with our manifest moral shortcomings and with a society which has such shortcomings fatally involved in its workings. Perhaps this problem cannot be resolved on secular grounds alone. But its religious solution should become more feasible once religious faith is released from pressure by an absurd vision of the universe, and so there will open up instead a meaningful world which could resound to religion (TD, p. 92).

3. The ontology of commitment

recognises that man exercises his judgment in the light of transcendent, eternal values that impose an obligation and an enabling upon him. Gracious powers active in our search for truth constitute 'a clue to God' (PK, p.324).

4. Worship and mystical vision. Polanyi affirms the *via negativa* enjoined by Pseudo-Dionysius the Areopagite, commonly regarded as a Syrian monk who lived around 500 AD, as 'the only perfect path to God.' Polanyi seems to regard this as the way to a valid Christian mysticism but he overlooks its Neo-Platonic roots. Nevertheless, religious worship is a 'heuristic vision' (PK, p.280) expressed in ritual activities which 'are the clues of the worshipper's striving towards God' (PK, p.281).

'Religious meaning . . . is a transnatural integration of incompatible clues and is achieved through our dwelling in various rituals and ceremonies informed by myths (M, p. 179).

It is therefore only through participation in acts of worship—through dwelling in these—that we see God. God is thus not a being whose existence can be established in some logical, scientific, or rational way before we engage in our worship of him. God is a commitment involved in our rites and myths (M, p. 156).

PK closes with these words:

We may envisage then a cosmic field which called forth all these centres by offering them a short-lived, limited, hazardous opportunity for making some progress of their own towards an unthinkable consummation. And that is also, I believe, how a Christian is placed when worshipping God' (p. 405).

If I understand this correctly, just as the divine creativity in a cosmic field called into existence active, living individuals with a creativity and opportunity of their own, so the Christian in worshipping God is placed in a field of gracious cosmic creativity and opportunity that liberates him to participate in it and to contribute to it (PK, p.405). For Polanyi God is not a fact to be

proved, but is the ultimate presupposition of all facts, knowing and experience, whose reality is found in the total devotion of worship. We cannot here enter into the debate as to what kind of God Polanyi believed in and how he viewed the objectivity of God.

11 The interpretation of Polanyi's ontology by E. Pols

1. Different senses of reality

E. Pols (pp 75-80) identifies three senses of 'reality' in Polanyi's thought, although at first sight he appears to have four ⁸:

Firstly, the universal intent of factual statements implies a pre-existing reality (PK, p 311). Further, by universal intent we commit ourselves to that which is objectively true (PK, pp. 104, 311), in a sense of 'true' that must be compatible with the existence of other statements or theories that might be 'more true'. Hence the term 'real' then must mean 'whatever it is that our (more or less) true scientific theories put us in touch with.' This allows degrees of 'the real' as defined by the advance of science. But this is *not* the degrees of reality in the ontological hierarchy because a science will deal with only one level.

Secondly, 'a thing is more real to the degree that it is more meaningful or significant, that is, to the degree that it reveals itself "more richly and unexpectedly in the future"' (p. 77, quoting Duke Lecture 4, p 4f). So 'minds and problems are more real than cobblestones'. Pols writes,

As Polanyi uses it, the criterion gives us not only the superior reality of mind, for which the theory of comprehensive entities would already have provided a *rationale*, but also the superior reality of what are in some sort mind products—not just problems, but as Marjorie Grene has pointed out in defending the criterion theories, works of art, inventions, and

laws as well [9].

Thirdly, Polanyi often uses the expression 'aspect of reality'. It might be thought that this term applies to a particular level of reality that is manifest by a comprehensive entity that exists on a higher level. But Pols (p. 29f) does not think that this is so, as 'aspect of reality' is universally used by Polanyi to refer to reality in sense one. Thus one theory of physics reveals one aspect of empirical reality and another theory of physics reveals a different aspect of the same reality. But both aspects are on the same level when it comes to the ontological hierarchy.

Fourthly, the degrees of reality of an ontological hierarchy in the traditional Platonic and Thomistic sense, which constitutes the basis for metaphysical affirmations.

Pols finds a difficulty in connecting the second meaning with the metaphysical sense of the reality of ontological hierarchies (the fourth meaning) in that terms used in the ontological hierarchy, e.g., molecules, cells, plants, animals, intelligence, readily display degrees of reality, but the same is not self-evident for problems, theories and machines. But the above criterion defines reality in terms of being revelatory of meaning or significance and this can be related to the first meaning above.

For theories and the like do not just *have* a degree of reality, they also *put us in touch with* aspects of reality (sense one). Indeed the theory manifests its reality (sense two), that is, reveals itself "more *richly and unexpectedly*" precisely by putting us into touch with aspects of reality (sense one) in more and more ways. The criterion for the degree of reality (sense two) of the theory is thus the degree to which it puts us in touch with reality (sense one).

But this criteria is of little use in determining reality, for the success of theories depends on other (scientific) criteria for deeming whether we have apprehended 'reality' in sense one.

Furthermore, the meanings of 'meaningful' and 'significant' for sense *two* (e.g. of a theory) are not identical to those for sense *four* (e.g. of a man). So the criterion of future revelations for a theory is not identical for this criterion applied to a level in the ontological hierarchy. This creates a problem. Pols writes,

Since Polanyi's whole doctrine about comprehensive entities that are real in sense *four* requires that we should uphold tacitly our knowledge of them [i.e., that the structure of awareness of particulars corresponds to the structure of apprehended components within a comprehensive entity], the point of an explicit criterion where that sense is at issue seems puzzling' (*Intellect and Hope*, p.78).

In other words, we do not have an univocal criterion by saying that something is 'real' to the degree that it reveals itself 'more richly and unexpectedly in the future'.

2. Degrees of being imply metaphysical realism

Pols (p. 74) notes the metaphysical implications of Polanyi's epistemology and ontology:

It should be noticed at once that Polanyi's doctrine *does* purport to give us something beyond the 'merely phenomenal'. Any doctrine must do so (at least by implication) that claims that there are degrees of reality (or being) and that we can know at least some of them. For the 'degree of being' doctrine is logically incompatible with a distinction between the merely phenomenal on the one hand and absolute reality, Being, Transcendence, or the thing-in-itself on the other. If there should be degrees of being and *all* the degrees should be phenomenal, it must still be true that a higher degree yields us *more* of being than a lower, so that the pejorative sense of 'phenomenal' is blurred sufficiently for us not to wish to speak of the 'merely phenomenal'. *Something* of being discloses itself in a phenomenon that has a higher degree of being than some other phenomenon.

On this topic Pols (p. 75) contrasts Platonism and Kant and thereby illustrates the anti-Kantian nature of Polanyi's ontology:

What Platonism really tells us [that] we cannot have, at least not as the embodied knowers we are, is Being alone, isolated from the multiplicity and process in which it is manifest. If that should be a deprivation, it is a lesser one than Kant announces to us in the first of the critiques, in which all the phenomena accessible to our understanding are of the *same* degree, equally distant from Being, which they do not so much disclose as make inaccessible to the knower.

This implies that, for Pols, Polanyi is not a Kantian.

3. *The homomorphic relation between the components of a comprehensive entity and the subsidiary components in focal knowledge*

Polanyi said in the Duke Lectures 'Man in Thought', Lecture 4 'The Emergence of Man', p. 5:

It seems plausible then to generalise to all other instances of tacit knowing that the structure of comprehension reappears in the structure of that which it comprehends and to go further and expect to find the structure of tacit knowing duplicated in the principles which account for the stability and effectiveness of all real comprehensive entities (quoted in Pols, p. 71)

When we turn our focal attention from a comprehensive entity to an aspect of its particulars, the joint meaning of the latter is lost. Polanyi expresses this by saying that the higher level 'is logically un-specifiable in terms of its particulars' (SM, p.45; cf. PK, pp 56, 63 *et passim*). For example, the purpose of a machine is not discernable from a focal awareness of its several parts. By this means Polanyi opposes Laplacean reductionism. The laws of a lower level cannot produce the laws of a higher level.

Polanyi's epistemology implies an ontological hierarchy with degrees of reality. This ontological

claim is based on the following epistemological claim (Duke, Lecture 4, p.6):

We can anticipate then the ontological characteristics of a comprehensive entity on the following lines. (1) Tacit knowing relies on our awareness of the particulars of an entity for attending to it. (2) If we switch our attention to the particulars, this function of the particulars is cancelled and we lose sight of the entity to which we had attended. The ontological counterpart of this would be: (1) The principles controlling a comprehensive entity would be found to rely for their operation on laws governing their particulars in themselves. (2) At the same time the laws governing the particulars in themselves would never account for the organising principles of a higher entity which they form.

Pols (p. 73f) comments:

It is not, however, a case of basing a metaphysics on an epistemological theory, for the theory is not only *about*, but *involves* a personal commitment. The metaphysical claim is, however, also applied to the knower who makes the commitment: he too is a comprehensive entity and his cognitive act can therefore be understood as a level of reality making use of subordinate levels. Polanyi indeed holds that there are many comprehensive levels, or comprehensive functions, in man, no one of which is reducible to lower levels even though it makes use of them.

Pols continues,

We thus come full circle: the entity [the human being] upon whose personal, or tacit, knowledge the whole epistemological viewpoint is based is taken as an example of the ontology that epistemology opens us; and, being so considered, he is seen to be capable of that same tacit knowledge . . . it would appear that the doctrine is reflexive in a way that might enable the epistemology to avoid at least the fourth problem mentioned in section I (i.e., that a theory of knowledge must be seen to be valid when we examine our knowledge of a putative theory of knowledge).

4 *The act of the recognition of the self-evident*

Pols (p. 82f) maintains that Polanyi fails to take into account an 'authenticating satisfaction or self-evidence, rational or empirical' in our acquisition of knowledge. Pols thinks that Polanyi avoids this due to his rejection of an explicit foundation for knowledge. But the epistemological tradition that appeals to the experience of the self-evident did not always equate that with an explicit foundation for knowledge, i.e., foundationalism. For example, the progress of knowledge that Plato enjoins provides a corresponding satisfaction, some explicit, at every stage, without any sure foundation until the form of the Good is apprehended as the foundation of all knowledge, but that apprehension is a personal knowledge without fully explicit grounds for it.

Pols puts it this way:

There are important points of similarity [of the epistemology of Plato] with the doctrine of Polanyi, but also important points of difference. At every stage of the progress of the knower there is an expenditure of effort not unlike the groping and plunging that Polanyi speaks of. The knower, while drawn towards what is still obscure to him, is, however, rewarded at every stage of his effort to see by a corresponding satisfaction. Certain of the satisfactions have an explicit character: exploration of the pattern of virtues, for instance, is supposed to lead to clear definitions. But all knowledge remains without a sure foundation until the Form of the Good itself is seen, and that foundation, while clear, satisfying, and present to rational intuition when at last it is reached, is not at all explicit in the sense Polanyi employs. It has been won by a kind of personal effort; it must be kept in view with a personal effort; and, while it satisfies the reason, it does not do so explicitly (p. 82f).

Pols maintains that some kind of self-evidence is needed to show that our knowledge relates to the metaphysical and not merely to that apprehended by common sense and

science [i.e., epistemological realism].

An epistemology adequate to enable us to speak of levels of reality must complete itself in a confirmation of our access to Being through the beings we claim to know. A concession that there is in the act of knowing a self-evidential factor that epistemology has not so far managed to elucidate might permit Polanyi to complete the metaphysical dimension of his philosophy. The image of sight has been so much used by rationalistic philosophers as to be in some discredit. Yet there may be a defensible sense in which the committed knower can be said both to *see* his object for what it is and to *see himself* in genuine engagement with the object. And it is also possible that the satisfaction thus gained may satisfy the demands of both reason and experience (p. 84)

Pols implies here that the mind has a direct apprehension of the existence and the mode of existence of the object of knowledge; that the knower is aware that he is in relation to the object of his cognition; and also that the knower is aware of his own existence in the act of knowing. In other words, the cognition of external entities must be grounded in one who is alive and thereby affirms his own existence. This 'aliveness' is then the basis for affirming mind-independent objective reality. This implies that primacy must be accorded to existence over essence in the order of being and the order of knowledge. This corresponds to the claim of Aquinas and many modern neo-Thomists that existence precedes essence in the created order. We can say further that the inner category of existence by which we apprehend the existence of external entities affirms one's own self-existence prior to the affirmation of the existence of external reality. (This is contrary to Kant's assertions in his 'Refutation of Idealism' in his *Critique of Pure Reason*, p. 245, B275, where he denies the possibility of the permanent within

the knower and therefore finds it in the reality of empirical objects.)

Pols (p. 84f) maintains that Polanyi allows that there is a self-evidence of a kind in certain personal commitments when he says that a new scientific theory imparts an intellectual beauty which is a token of contact with reality (PK., p. 144f). Pols notes:

The dark, groping, or plunging function of reason, guided presumably by some foretaste of what it is to enjoy, finds a completion in the beauty it has discovered. It is the familiar Platonic point about the affinity of beauty and truth, and here we can take it to mean that the commitment *has a reason* in the self-evident truth-in-beauty of the theory (p. 84f).

So Pols maintains that Polanyi's epistemology justifies claims to metaphysical knowledge of degrees of reality in various beings if we regard

our tacit upholding of the reality of a comprehensive entity as a *recognition* [of the self-evidence of entities as entities]. If our grasp of comprehensive entities is to be a grasp of them *as they are* then it is not so much a tacit *upholding* of their status that is at issue, but a *recognition* or *enjoyment* of them as having that status. Seen in this light, the plunging, groping character of tacit knowing is no more vital than the simultaneous discovery [of the self-evidence that we are in contact with an ontological hierarchy] that is its issue. The unification or grasping together is, then, not so much creative as re-creative. Nor does this quite make the subtle point, for the re-creation at the same time satisfies itself that it is just that. It is important, then, both that we *recognise* an entity as such and that we *take it to be a recognition* that we are engaged in. We dwell in the entity (in somewhat Polanyi's sense) when we recognise it, but the recognition is not in the drawing together of elements, but in a (subsidiary) *taking of satisfaction* in the way in which the elements *are* the elements of the entity. The assurance or self-evidence is part of the act itself, and though no *explicit* assurance, it is no less important for that (p. 85)

Pols continues:

An entity *is* a unity in a manifold: to confirm our capacity to discern that kind of unity is to confirm our capacity to *recognise* beings as an expression of Being. For the unity we find in recognising the unity of a comprehensive entity is not just *its* unity [e.g., the unity of a picture of an entity]—not just the unity of a particular among many particulars [i.e., empirical realism]—but a unity that is general or universal [i.e., tantamount to a metaphysical assertion of existence]. Our recognition transcends the particularity of the entity we recognise: the presence of a particular entity among the Many is the partial presence of the (One) transcendence it exemplifies (p. 85f).

This latter claim constitutes the affirmation of metaphysical (and transcendental) realism. Pols notes that the satisfaction that we achieve in such acts of recognition is both rational and empirical:

The demand of the reason to rest in the general is satisfied simultaneously with the demand for experiential presence (p. 86).

Pols (p. 86f) summarises his reconstruction of Polanyi's epistemology as follows:

As knowers we recognise:

- (a) beings as unities in a manifold [i.e., the claim of empirical realism];
- (b) beings as expressions of Being (the recognition is at once particular and universal, [and] is engaged both with the Many and the One) [i.e., the claim of metaphysical realism];
- (c) the being of the knower, part of whose own unity-in-a-manifold is precisely this capacity for recognition [implying a claim for a metaphysical ontological self];
- (d) the reflexivity of this capacity for recognition—a reflexivity that gives us the contents (a), (b), and (c);
- (e) that the capacity for recognition yields its own self-evidence in its exercise [which self-evidence implies the Thomistic claim that existence is prior to essence in both being and knowing]. Only an argument that permits this capacity its confident exercise has a hope of establishing metaphysics. It is much as though we managed to call into being the full

exercise of the faculty we are trying to defend.

Pols (p. 83) indicates that a satisfactory self-evidence doctrine has not hitherto been developed. His claim for such sounds dangerously like the notion of an intellectual intuition that Kant denied was possible for a finite being, although such might be supposed to be the form of divine cognition. But if we allow that the mind can apprehend an objective value, such as beauty and goodness, then we must allow an apprehension that transcends the merely sensational. Polanyi's belief in the objectivity of aesthetic and moral judgments presupposes the reality of such a transempirical apprehension whose justification can be no more than self-evident. If we accept this we might well argue that the category of existence likewise gives us a self-evident apprehension of the existence of ourselves in the act of cognition which confers the self-evidence that we are in contact with external realities, whose reality is not constituted by us.

5. Pols's extension of the notion of personal knowledge

Pols (p.87f) suggests that, with reference to the claim to have metaphysical knowledge, our knowledge is personal in the following two ways that are distinct from Polanyi's notion of the 'personal' in knowledge. Firstly,

its personal character lies not so much in the groping and plunging [of tacit integrations], but in the complexity and richness of the personal drives that are engaged in the groping and plunging, and in the potential unification of the person at a higher level [in the Platonic sense of the recreative power of grasping true value] that they foreshadow.

Secondly,

it is personal in the further sense that the structure of the person is part of the subject matter upon which it is directed. Much of the affective richness of the knower is engaged in the effort, but the *nature* of that affective

complex and its interaction with the more narrowly 'rational' part of our nature is part of its reflexive concern. We cannot successfully engage our affective nature in a transforming search for our highest subject matter unless our own nature becomes part of that subject matter.

Pols (pp.88-90) thinks that Polanyi has not sufficiently distinguished philosophical knowledge from scientific knowledge. The latter deals with the universal and its quantification and prescind from the concrete, whereas philosophical knowledge deals with existents and their significance within the hierarchy of being in order to oppose reductionism. According to Pols, without a doctrine of self-evident apprehension of ontological realities in the act of recognition, Polanyi

does not really . . . complete the task of supplying a foundation for the philosophic knowledge from whose vantage point he contemplates the sciences . . . the justification of the philosophic mode of attention is also a justification of metaphysics (p. 88).

Pols notes that Polanyi's anti-reductionism advocates a hierarchy of the sciences. Pols says,

His own doctrine even seems to suggest that we may hope to have one day a number of sciences, none reducible to a science of a lower level; each adequate to its own level; each enunciating laws, ordering principles, or operating principles that give us, without supplementation by an informing philosophic knowledge, the reality of each of these levels (cf., PK, pp. 35, 344-346, 381, 384-385, 397).

But Pols continues,

An alternative view, and one that fits more happily with his own best insight, is that of the penetration of each science by the philosophic mode of attention in such a way that the scientist might see with a philosophic eye the concreteness of his subject matter, and see consequently in what respects [the] techniques or modes of explanation he might employ might blur that full concreteness (p. 89).

Pols believes that such an approach

is a necessary counter to the reductionism implied when a scientist, such as a biophysicist or a sociobiologist, working at a particular level of reality sees his theories as all-encompassing explanations of all observable reality.

12 Marjorie Grene's objection to Polanyi's ontological hierarchy¹⁰

Marjorie Grene, a professional philosopher, was a co-worker with Polanyi when he was writing *Personal Knowledge*. She believed that Polanyi's doctrine of tacit knowing was a 'unique contribution to philosophy' (p. 164), 'the conceptual instrument for a one hundred and eighty degree reversal in the approach of philosophers to the problems of epistemology' (p. 168). But she found Polanyi's belief in an ontological hierarchy 'less than convincing' (p. 168). The principal objection she affirms is that Polanyi sought to defend the mind's separateness from the body, whereas his epistemology implies the essentially incarnate nature of mind.

Polanyi believed that he was reviving dualism, when in fact he was helping to refute it. For the theory of mind mediated by the doctrine of tacit knowing is a theory of mind as fundamentally and irrevocably incarnate. In fact, Polanyi is one of the few thinkers of this century to have found adequate concepts through which to overcome Cartesian dualism, and to philosophise outside the impoverished traditions of empiricism and rationalism that it had generated (p. 169).

For Grene man is essentially a psychosomatic unity.

My mind is a certain class of competences that make possible focal-subsidary performances in which I rely especially on clues interiorised through the central nervous system in order to execute not so much motor as cerebral activities . . . Yet Polanyi never realised, or ceased to realise,

the subtlety of his own anti-reductionist position; he was so much concerned to refute the 'denial of consciousness' by behaviourists that he failed to recognise how essential to his own philosophical position was the insistence on embodiment as the framework of mentality (p. 170).

Marjorie Grene recently expressed her disenchantment with Polanyi's stratified universe in these words:

The ontological dogmatism and hopelessly anthropocentric evolutionism of the final chapter [of PK], as well as its closing Christian apologetic, must be discouraging, in my view, to supporters of the model of commitment for epistemology and the philosophy of science. Polanyi's late work on tacit knowledge, being cosmologically less ambitious, may help to correct this imbalance.¹¹

Prosch seeks to defend Polanyi's insistence that the mind is ontologically an irreducible reality¹². He finds Grene's divergence from Polanyi indicated in her remark,

In fact it occurred to me that much as, by Wittgensteinians, the meaning of a word was alleged to be its use, so for Polanyi (and in fact) the meaning of the brain was the mind, or the meaning of the brain was its use, which is the mind [10, p. 170].

Grene thinks that Polanyi was so concerned to refute the denial of consciousness by behaviourists that he fell into the opposite error of Cartesian dualism. Grene thinks that reductionism can be adequately countered by the from-to structure of tacit knowing and there is no need to refute it by ontological arguments.

Prosch notes that Polanyi in effect says in TD, p. 33f, that there is an analogy between the structure of tacit knowing and the structure of a comprehensive entity that is known [12, p. 226]. Polanyi held that a lower level in a comprehensive entity could not create the principle(s) of the higher level in its own terms. The lower level leaves its boundary conditions open and cannot gain control over them so as

to bring a higher level into existence that would control these boundary conditions. So, ontologically, and not merely epistemologically, reductionism is impossible. Prosch believes that Polanyi has not provided a strict proof that our world is a stratified one, for the structure of tacit knowing is *analogous* to the structure of a comprehensive entity and we cannot transcend that analogous relationship. Our knowing is fallible. But he does think that Polanyi shows that the belief that nature and human life constitutes an ontological hierarchy is the most reasonable belief that we can have, given what we know along with Polanyi's definition of reality as that which will manifest itself in unpredictable ways [12, p. 233]. Prosch maintains that Grene is wrong in supposing that when Polanyi argued for the actual reality of human consciousness he was reintroducing Cartesian dualism [12, p. 228f]. For Polanyi, as much as for Grene, the human mind is always incarnate in the body. In a recent comprehensive study of Polanyi's understanding of the mind Robert P. Doede has confirmed that Polanyi was not a dualist but his view of the mind facilitates solutions in some of the classical problems in the philosophy of mind, like the phenomenology of first-person experience and the knowledge of other minds¹³.

13 The criticisms of Polanyi's anti-reductionism by Robert L. Causey

Causey¹⁴ notes that Polanyi draws a distinction between two types of boundary conditions:

The experimenter imposes restrictions on nature in order to observe its behavior under these restrictions, while the constructor of a machine restricts nature in order to harness its workings . . . We can distinguish these two types of boundaries by saying that the first represents a test-tube type of boundary whereas the second is of the machine type. By

shifting our attention, we may sometimes change a boundary from one type to another (p. 1308 from 'Life's Irreducible Structure', *Science*, Vol. 160, pp. 1308-1312, 21st June 1968; KB, Ch. 14).

Causey objects,

But this seems to allow that we might change an irreducible system to a reducible system (or vice versa) by shifting our attention. If this is the case, then Polanyi has a strange irreducibility thesis! (p. 234).

But Causey has misunderstood Polanyi. One can shift one's attention from the operation of an internal combustion engine as a source of power to the combustion process in the combustion chamber or to the stresses in the crankshaft. One then moves from the irreducible purpose embodied in the engine to the reducible activities in its parts.

Causey goes on to complain that Polanyi has not made clear the distinction between the two types of boundary conditions (p. 234), and hence left unclear his notion of dual control, when he says, 'Boundary conditions of inanimate systems established by the history of the universe are found in the domains of geology, geography, and astronomy, but these do not form systems of dual control' (op. cit. p. 1310). But Polanyi goes on immediately to clarify why there is no dual control: 'They resemble in this respect the test-tube type of boundaries of which I spoke above' (ibid.).

Causey notes that Polanyi seeks to support his thesis of the irreducibility of organisms by the example of the DNA molecule whose bases function as a code. To counter the view that a particular DNA base sequence is merely a product of chemical reactions in its evolutionary history, Polanyi points out that it can function as a code 'only if its order is not due to the forces of potential energy' (op. cit. , p. 1309). The point is that ordinary chemical molecules have orderly structures due to the maximising of their stability, corresponding to a minimum of potential energy. Such

orderliness lacks the capacity to function as a code. Some further factor is needed to allow a chemical sequence to be a code and not the necessary product of previous chemical reactions.

Causey wishes to show that Polanyi's argument for irreducibility in principle fails because it does not rule out the possibility that all organisms, including engineers, are reducible to physico-chemical reactions, and if that is so, then machines must be ultimately reducible to such reactions. In seeking to counter Polanyi Causey distinguishes two different kinds of explanation of a structure: firstly, the explanation of its empirical possibility; and, secondly, the explanation of its existence (p. 231).

Causey also distinguishes two types of reduction: direct micro-reduction and indirect reduction through higher levels. A micro-reduction is an explanation of the behaviour of a structured whole in terms of the individual behaviour of its constituent parts (p. 230f). An indirect reduction occurs when the feature of an object cannot be directly reduced to lower levels but can be explained by reference to levels higher than that of the object. Causey gives the example of explaining why the molecular structure of a diamond is what it is and is different from graphite. This can be done with reference to a geological history of great heat and pressure.

Such an explanation might then be reduced to a level lower than that of the object. A reduction accomplished in this way can be called an 'indirect reduction through higher levels', in order to contrast it with the more direct reductions mentioned above (p. 232).

Causey reconstructs Polanyi's argument for the irreducibility of the DNA base sequence, i.e., that it is code, as follows. Firstly, chemical bonding theory can explain the empirical possibility of a particular base sequence, but not its actual sequence. Therefore the actual sequence cannot be explained merely

in terms of the results of chemical reactions. Causey wishes to argue that Polanyi fails to remove this reductive explanation as a possibility. Causey claims, 'Polanyi has only shown that the *existence* of a particular DNA base sequence cannot be reductively explained in the same way as its *empirical possibility*' (p. 235)

Causey continues,

He [Polanyi] points out that the existence [of a DNA base sequence] cannot be explained simply in terms of bonding forces. He mistakenly thinks that this establishes irreducibility, for he says that it is irrelevant whether the base sequence can be accounted for by the evolutionary history of the DNA molecule. But evolution is *not* irrelevant (p. 235f).

Causey wrongly thinks that Polanyi supposes that the evolutionary history of the DNA base sequence is irrelevant to its actual form. But Polanyi does not hold this. What he does maintain is that the history of the DNA sequence is irrelevant to his *argument*. Polanyi argues that the DNA sequence is a code and the code, to be a code, cannot be merely the product of chemical reactions. The base sequence bears information.

Causey allows that Polanyi may believe that 'an evolutionary explanation of the existence of a structure is necessarily irreducible to physical chemistry' (p. 236). But Causey begs the question when he asserts that it is not. He *assumes* that an *indirect* reduction of a DNA base sequence is possible in principle. This is evident in the third supposition of the following paragraph:

Suppose that we have a fabulously detailed theory of evolution. Suppose that, with a detailed description of a past state of the world, plus our theory of evolution, we can explain the existence of the base sequence structure of a particular DNA molecule. Finally, *suppose that all of the processes involved in the evolution of this base sequence can be micro-reduced to the molecular level*. Then we will have provided a reductive explanation of the existence of the

DNA base sequence. Thus, this example of life's structure is not irreducible to physics and chemistry' (p. 236, *my italics*).

Causey thus thinks that Polanyi's argument fails to close off this reductive possibility.

Likewise, Causey thinks that Polanyi has failed to prove the irreducibility of machines because he has not allowed for the possibility that human behaviour could be reduced to physics and chemistry. But Causey has failed to recognise Polanyi's point that there is a *logical* difference between the two levels in a machine or an organism. The higher level bears a purpose that cannot be present in the lower level. Causey's failure to understand Polanyi here is evident when he distinguishes a 'higher geological level' from the lower atomic level when seeking to explain the origin of a diamond's atomic structure (p. 232). For Polanyi it would be very clear that these are entirely on the same non-teleological level.

14 The objections of A. Olding to Polanyi's ontological hierarchy

Olding rejects Polanyi's belief in an ontological hierarchy¹⁵. He says,

Polanyi's argument for such a hierarchy of being is confused and depends for its apparent strength on an illicit mixing together of ontological and what may be loosely called methodological claims (p. 97).

His view is 'outrageous' (p. 98) and 'blatant mystery-mongering' (p. 99). Polanyi, followed by Grene¹⁶ drew a parallel between, on the one hand, the 'code' of the DNA molecule and its physico-chemical constituents and, on the other hand, the information conveyed by a printed page and its physical make-up (KB, p. 131f).

Olding objects,

There is no distinction between the chemistry of the DNA molecule and the order of the bases any more than

one distinguishes between the chemistry of acetic acid and the disposition of its component atoms. One might say the structure of the molecule *is* part of its chemistry. The fatally confused step is to say that the order of bases 'functions as a code' as if acting as a code involved something over and above acting chemically (p. 98).

Polanyi has gone from speaking of 'information content' in a technical sense, as used in information theory, to a quite different use more akin to 'meaning' as when we speak of the meaning of a piece of prose. It is, of course, the first sense which is used in biological *science* and will be insisted upon by the reductionist as posing no threat to his reductionism (p. 99).

Olding's basic point is that the laws of nature are operative in both organisms and machines and hence Polanyi's distinction between higher and lower 'principles' in them is invalid. Rather, one should distinguish between the *interests* of the engineer and machines that simply operate according to the laws of nature. Olding refers to a criticism of John Anderson¹⁷ that has been called the 'two—worlds argument' by John Passmore¹⁸. Anderson argued that once two ontological levels are distinguished there is no way that they can, without contradiction, be brought together again in mutual interaction. Anderson used this argument to counter such metaphysical ideas as the distinction between the Platonic forms and the world of becoming. Olding adapts this argument to Polanyi's understanding of machines, because, 'with the operation of higher order principles the matter of which the machines are composed must act out of character' (p. 101). Olding goes on to explain,

This is so because, in not taking these higher order principles as merely what occurs when bits of matter come into a certain relation with other things in the universe, e.g., engineers, they must be regarded as of the nature of those bits of matter. By then saying that the lower order

principles are 'open' to the higher, i.e., they go on irrespective of the existence of the higher even although the latter also affect the action of the former, he is asserting that the matter of machines has both the character X and not-X (p. 101).

But this seems to me what Polanyi is not asserting. Olding's criticism seems to assume reductionism rather than disprove Polanyi's non-reductive view of machines. Of course, Polanyi is not denying that they entirely operate according to the laws of nature. His point is that their principles of operation, namely, their purposes as embodied in their configurations, express purposes, e. g. the production of energy or operation as a tool, which are not themselves expressible in terms of the laws of nature. Of course, one can easily say that such purposes exist only in the minds of designers and users, but no machine exists as a *machine* apart from such purposes. A car is more than a pile of metal parts. The significance of a machine is endowed by us, but it does itself embody a purpose and exist as such.

Olding exploits similar argumentation as the above to refute emergent evolution and opposes Polanyi's introduction of 'vitalism', without making clear that Polanyi's version of the latter meant the comprehensive operation of organisms, not a metaphysical 'spirit' different from them. For Olding natural causes can only produce their natural effects and not some created novelty beyond these effects. But this fails to note how corporate causes can produce novelites, e.g., in the production of a tornado or lightning. The DNA molecule instigates chemical reactions that produce working organs, so united in their mutual interaction as to constitute an organism. The organism can have principles of operation not describable in terms of chemical reactions or explainable only in those terms. The modern science of complexity has shown how new orders of existence

proceed from natural causation. It may be too expansive a metaphor to speak of DNA as a 'code' or 'blueprint', but it can be said that DNA contains that which ensures physical continuity of form across generations. Likewise, altered DNA can produce novelty in resulting organisms.

15 Emergence and complex dynamic systems

T.F. Torrance has drawn attention to the way that Polanyi's doctrine of the two different levels in a comprehensive entity anticipated and finds confirmation in modern complexity theory that has a relevance to the description of the growth of organisms¹⁹.

Here closed systems obeying the classical laws of entropy at one level are coordinated with open systems at a higher level characterised by a minimum motion which enable us to move from one type of description to another, from a thermodynamic to a dynamic description of it, in which *time*, needed for many interactions, is given its integral place within the orderly structures that spontaneously arise. Here we have a new type of time-dependent functional order coordinating space-time behaviour to dynamic processes within the system, but it rests nevertheless on the validity of connections holding at the lower level which are subject to thermodynamic laws in the classical formulation—including thermodynamic irreversibility and the rejection by the second and third law of any *perpetum mobile* (p. 19f).

Torrance continues,

Undoubtedly the hierarchical coordination of levels of order involved in this approach throws a very helpful light on the evolution of the expanding universe: higher and lower levels of organisation and order spontaneously emerge which rest on the basis of physico-relations at a lower level obeying classical thermodynamic law, while at the same time those levels of organisation are shown to be indeterminate, to use Polanyi's expression, in that they are left open and are controlled by the higher level at their

boundary conditions. Here then, where we least expect it, precisely in thermodynamics, scientific account can be given of how in the expansion of the universe new forms of coherence and order of a richer and more open-structured kind continuously and spontaneously emerge. This applies, of course, to the highest form of life, man himself, for within the perspective of natural science he is to be regarded as the product of such spontaneous self-organising order . . . in this . . . account of the extension and reformulation of thermodynamics, and its application to open systems to account for the emergence of new, unexpected, unpredictable forms of spontaneous order . . . we are given strong support for the earlier account of Polanyi, who must be said in a very remarkable way to have anticipated the discoveries which were recently acclaimed with the award of the Nobel Prize . . . there is little doubt that the structure of Polanyi's own creative developments carried within it pointers toward the fuller development of the thermodynamic programme. What lay behind this was his persistent conviction as to the contingent yet profoundly intelligible character of reality replete with inexhaustible possibilities of order' (p. 20f).

J.W. Stines also finds a correlation between Polanyi's thought about our knowledge of comprehensive entities and modern complexity theory [20].

Polanyi's notion of 'gradients of meaning' sloping in the direction of more stable configurations and, in a

non-deterministic way, evoking our response, anticipates, but is enriched by, chaos theory's strange attractors and non-linear determinism (p. 225).

Stines notes that, in the grasp of recognising a comprehensive entity there is a dialectical relation between the act of comprehension and the organisational unity of the entity, which determines the boundary conditions of its lower levels. Whatever is accredited as being real and/or true is appropriated and embodied by the knower and the knowing process.

Stines comments,

Here chaos theory is remarkably anticipated; and chaos theory extends and verifies what is implicit here. The feedback and iteration which chaotically generate order, which is then indwelt by the knower—or, which, in ontological terms, is subordinated to a new level of emergence—is a model of the non-linear way of emergence. Novel boundary conditions emerge in a non-linear and non-explicitable way in dialectic with prior conditions. No mere specification of subsidiary components and the laws which govern them explains or necessitates the comprehensive principle which subsumes them. The model of calling and evocation to which Polanyi had recourse receives reinforcement here; for clearly our acts of accrediting and placing at our disposal (indwelling) are functions of a sense of something being achieved which is irreducible to potential energy and specifiable deterministic processes. The movement toward new levels of integrations, epistemo-

logically and ontologically, is clearly not as by necessity or destiny, but as by vocation, whose corollary is contingency (p. 225).

16 Concluding comments

Michael Polanyi has presented a substantial case for believing that there is an irreducible ontological hierarchy in living things. He himself would not maintain that this is a coercive proof for his view that all knowledge is fallible runs counter to such a notion. Pols believes that Polanyi's doctrine can be extended by including the intuitive experience of the self-evidence of existence and value to form a valid metaphysical realism. We have seen that Polanyi was misunderstood and that defences of his doctrine have been presented by Harry Prosch and others. His doctrine anticipated the modern understanding of the emergence of complex thermo-dynamic systems far from equilibrium to a remarkable degree. It is true that his accounts contain lacunae that need further clarification and the validity of his approach needs further clarification in empirical exemplification within modern biological research. But he has given us a substantial argument for countering the reductionism and non-teleological claims of many, if not most, modern biologists.

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