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Michael Polanyi's Philosophy
and its Educational Implications

Roberta Vienneau

A Thesis
in
The Department
of
Educational Studies

Presented in Partial Fulfilment of the Requirements
for the Degree of Master of Arts at
Concordia University
Montreal, Quebec, Canada

May 1991

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ISBN 0-315-68782-7
Abstract

Michael Polanyi's Philosophy and its Educational Implications

Roberta Vienneau

This thesis shows how Michael Polanyi's philosophy of personal knowledge draws within its perspective a consideration of the relationship between man and reality. Associated notions of objectivity, rationality, and truth are shown to expose the need for a concept of the tacit in order to understand the nature of knowledge and the full significance of what it means to know.

Basically, Polanyi's concept of the tacit affirms the mind's ability to perceive coherence and thus serve as an instrument of judgment and orientation in the pursuit of truth. The full potential of this innate ability is evoked, extended, and refined through the assimilation of language and of formal, articulated systems of thought.

The implications for education extend from the dual importance Polanyi places on articulated systems of thought and on tacit powers of the mind. Education should: (1) preserve and pass on subsidiary contexts for the mind that represent orientation towards truth (curriculum); (2) present opportunities for the integration of subsidiary content (methods); (3) leave room for a consideration of educational outcomes that emerge from the integration of subsidiaries, but that are not prescribed by them (methods); (4) aim to explicate the values that educational decisions tacitly endorse (decision-making); (5) foster the natural trust and effort of the student, illustrate the
complexity and depth of a discipline, and awaken the student to a value that is transcended by a discipline, but that is only able to be apprehended through it (role of the teacher); (6) develop and use an evaluation model that will take into account qualitative modes of achievement, as well as measurable behaviours (educational evaluation).

The conclusion deals with a current issue that threatens to affect the whole foundation of the tradition of western education. As the proportions of visible and ethnic minorities attending Canadian and American educational institutions rapidly increases, there is a simultaneous increase in the urgency of the need to assess the relevance and even the desirability of the traditional "white western civilization" curriculum. This thesis addresses the issue in light of Polanyi's philosophy, showing how Polanyi bridges reason and creativity in man through his concept of the tacit, and reason and truth through his concept of personal knowledge.
Acknowledgements

When I began preparatory work for this thesis, I had vague, but strong (that is, "headstrong") notions about what I wanted to do. Three concepts were important to me: the concepts of meaning and memory, and the concept of differences. After many, many hours of discussion with my adviser, Professor Harold Entwistle, I came to realize that these concepts were far too general and broad to be dealt with adequately in a single thesis. I felt as if I were trying to travel a river, but kept getting grounded because I kept steering my boat towards its shores. Professor Entwistle tugged me out each time, showing me that I should travel the river instead of the shores, and that the best way to do so would be to find and travel its current. By helping me see that Michael Polanyi's philosophy resonated with my soul, Professor Entwistle helped me find the current I needed. It was a long process, and I truly appreciate the fact that he did not give up on me. So for what I view as his extremely patient, kindly, and constant guidance throughout the writing of this thesis, I thank Professor Entwistle. I can only say that in order to be an "admirable" riverguide, I believe that three qualities are necessary. The person must be a competent riverguide: he must himself know the river, the current, and the strength
of the current. The person must also be a sensitive and discerning riverguide: among all the rivers that it is possible to travel, the riverguide must be able to know which one the student wants to travel by his/her description of its shores and muddy waters. From the vague clues given by the student at the outset, the riverguide must be sensitive enough to pick them up, and discerning enough to recognize the river by its shores. So in addition to his patience and guidance, I sincerely wish to thank Professor Entwistle for his competence, sensitivity, and discernment as my adviser; you were an "admirable" guide.

I would also like to mention a professor who particularly impressed me during my time as a student at Concordia: Professor William Knitter. Professor Knitter's seminars were intensely stimulating and vibrant, engendering an intellectual joy that, to me, is what education is all about.
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Introduction

Michael Polanyi's epistemology is a coherent philosophy of knowledge that is as aesthetic as it is practical. His words can be like poetry, invoking Ulysses-like feelings on the voyager's path of cognitive discovery:

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. (Polanyi, 1958, p. 143)

In addition to the poetic charm of his writing style, however, the main aesthetic appeal of Polanyi's thought is derived from its clarity, scope, and profundity.

Polanyi's philosophy is like a crystal, whose brilliance can either be seen, shining openly, or felt, resonating throughout his work. The core of the crystal is Polanyi's assumption of rationality in both man and nature, or reality. His special concept of personal knowledge is a concept that explores this relationship by defining and describing the nature, function, and purpose of knowledge in terms of an individual, personal "vision" of reality. Thus, although Polanyi's philosophy is explicitly concerned with knowledge and the justification
of knowledge, it is tacitly concerned with the nature of reality and of man's relation to reality.

Polanyi leaves no evolutionary stone unturned in his designation of this relationship between man and reality: his philosophy enters as easily into the biological domain as it does into the ontological domain. Consequently, the range of Polanyi's philosophy is immense, both in scope and in depth.

In terms of scope, Polanyi's theory of knowledge is continuous, in the sense that it does not assume a division between animal and man as we enter into the region of human intellectual life, but only an advantage, which has resulted in language. Animals, Polanyi says, possess prearticulate capacities to contrive, to observe, and to interpret experience, just as human beings do. A very slight initial advantage in these innate faculties in human beings accounts for man's capacity for language, and it is due to language that the range of man's inarticulate capacities can be extended over domains of intellectual life that far surpass the range over which animals can extend their inarticulate capacities.

Man is not much superior to a rat in finding his way in a maze; and it is not clear that he possesses in other ways much greater native
intelligence than the animal for reorganizing remembered experiences. But the bare unaided memory of animals can only collect scraps of information, unsystematically; nor could man do much better, but for the power of systematization dependent on speech. (Polanyi, 1958, p. 84)

Not only does articulation extend man's inarticulate capacities by aiding memory, as the preceding passage suggests, but articulation also aids the imagination: "Articulation pictures the essentials of a situation on a reduced scale, which lends itself more easily to imaginative manipulation than the ungainly original" (Polanyi, 1958, p. 85).

However, although language empowers man's native intellectual capacities, the inarticulate nature of these faculties is nevertheless continuous with the prearticulate capacities of animals. These capacities run through knowledge. They shape knowledge. They constitute the tacit component of all knowledge.

In terms of depth, Polanyi's philosophy can also be seen to be hierarchical once it enters into the domain of human intellectual life. It is hierarchical in the sense that Polanyi's view of both mind and reality is based on a conception of the independent functioning of sub-systems
within any higher level system that accounts for, but does not determine the higher level of functioning: "The true nature of a thing composed of different levels of reality was found revealed by its most comprehensive feature, forming its uppermost level" (Polanyi, 1959, p. 71). An aspect of the "hierarchical" dimension of Polanyi's philosophy and its educational implications will be discussed in chapter 6.

This thesis is divided into two sections: one section will describe the philosophy of Michael Polanyi (chapters 1, 2, 3, and part of 6), and the other section will discuss the educational implications of his philosophy (chapters 4 through 9).

In describing Polanyi's philosophy in the first section, the overall aim will be to elaborate on those areas of thought or concepts that establish Polanyi's view of the particular and personal nature of the relationship between man and reality. In order to do so, two steps will be necessary: one that will show, first of all, that there is a relationship between man and reality, and one that will show how this relationship is expressed.

Consequently, chapter 1 will discuss Polanyi's conception of objectivity in knowledge, and how it differs from the
objectivist sense of objectivity in order to see, first of all, that there is a relationship between knowledge and truth, and, consequently, between man and reality. At the heart of this relationship will be found the "crystal core" of Polanyi's philosophy: as stated previously, his assumption of rationality in both man and reality.

Having established the nature of the relationship in chapter 1, chapter 2 will then show how this relationship (between man and reality) is expressed. Although it is true that man's vision of reality is ultimately expressed as knowledge, what is important is that the relationship actually defines the entire process of knowing as well as all of knowledge orientation (that is, the acquisition and growth of knowledge). Thus, as we move along in chapter 2 from an understanding of how, to Polanyi, the shaping of knowledge is really the shaping of a conception, we come to understand the full significance and meaning of Polanyi's concept of personal knowledge. The overall aim, then, of chapters 1 and 2 will be to highlight Polanyi's conception of the nature of the relationship between man and reality in order to understand the full meaning of personal knowledge.

Chapter 3 will elaborate on the scope of Polanyi's
philosophy by discussing the roots and manifestations of man's tacit powers and intellectual passions. The aim will be to show in what ways man's intellectual coefficients are similar to, or continuous with the powers and strivings of animals in their intellectual life, and in what ways they are different.

An understanding of Polanyi's views regarding the nature of the relationship between man and reality, and the nature and manifestation of the tacit coefficients of man's intellectual life, are necessary in order to arrive at the range of educational implications that can be drawn from Polanyi's work. The implications that will be discussed in chapters 4 through 9 will concern curriculum, educational decision-making, methods, student and teacher roles, forms of knowledge, and educational evaluation. However, because Polanyi's philosophy is so coherent, rich, and "tightly woven", we can only apply his philosophy once we have understood it through the reconstruction of his thought. This is what chapters 1 through 3 attempt to do: to reconstruct the thought of Polanyi. This method is necessary for a number of reasons.

First of all, as stated earlier, one of the main aesthetic features of Polanyi's thought is its coherence. Any attempt to arrive at precise definitions of his terms
as an introduction to the implications of his philosophy would risk destroying this coherence. Pirsig describes the type of risk I am referring to in the following manner:

When analytic thought, the knife, is applied to experience, something is always killed in the process. That is fairly well understood, at least in the arts. Mark Twain's experience comes to mind, in which, after he had mastered the analytic knowledge needed to pilot the Mississippi River, he discovered the river had lost its beauty. (Pirsig, 1974, p. 70)

Yet, however risky analysis may be, precise definitions are necessary--Pirsig goes on to say that, although something is always killed in analysis, "what is less noticed ... something is always created too" (1974, p. 70). Definitions will therefore be given, but they will be given gradually, within the context of Polanyi's thought, so that the understanding that is arrived at (the "something that is always created") will enhance our appreciation of its coherence and depth.

Polanyi himself would see this as a necessary process for a number of reasons. To begin with, Polanyi is introducing a number of terms and concepts to the language we use in speaking about knowledge--for example, subsidiary
and focal awarenesses, tacit knowledge, personal knowledge, indwelling, foreknowledge, ineffable domain, domain of sophistication, prearticulate, tacit powers, intellectual passions, heuristic function, shaping of knowledge, fundamental indeterminacy of knowledge, and unspecifiability of particulars.

It has been suggested that precise definitions of these typical Polanyian terms are hard to come by in his writings (Allen, 1978, p. 168), and that Polanyi himself does not define any of them. This is so. One must essentially formulate one's own definitions in reading Polanyi, modifying them as one goes deeper into an understanding of his philosophy. This is to be expected, however, whenever new terms are introduced into any technical parlance. Polanyi describes the process whereby words acquire their meaning through their use, as a result of the Law of Iteration and Consistency in language: "Only when repeatable utterances are used consistently can they have definite meaning, and utterances without definite meaning are not language" (1958, p. 79).

The new terms introduced by Polanyi in his theory of knowledge can acquire meaning for the reader only by seeing how and when Polanyi uses them in his philosophy. The reader must come to an understanding of where lies the
overlap, and where lies the distinction between such terms as tacit knowledge and personal knowledge. My aim is to help clarify these distinctions in the first section.

Another reason why the elaboration of Polanyi's philosophy through the reconstruction of his thought is necessary is because we are in the domain of sophistication. Polanyi's term that designates the area of thought distinguished by the adoption of an articulate framework. In this domain, he says, precision in articulation can only occur through understanding; otherwise, the "fumbling" that occurs is the result of definitions encumbering tacit thought (Polanyi, 1958, p. 93).

Thus, it would not help the reader to merely define Polanyian terms at the outset. Because of the Law of Iteration and Consistency operating in thought and speech, and because we have entered into the domain of sophistication, it is necessary that we first increase our understanding of these terms that represent Polanyi's philosophy before applying the thought they articulate to issues in education. Otherwise, we risk applying Polanyi's philosophy in a shallow or haphazard way that detracts from its "truer", deeper meanings and implications. I will give an example of such a "shallow" application of his philosophy in a discussion of forms of knowledge in chapter 8.
Why did I choose Polanyi's philosophy to address issues in education?

My first encounter with Polanyi's thought was a little book entitled "Meaning", which he co-authored with Harry Prosch. The book basically describes the structure of meaning as a triadic structure composed of the knower and his subsidiary and focal awarenesses. The tacit act of the knower constructs meaning by integrating the joint meanings of his subsidiary awarenesses.

Having come from an educational background in psychology, I had come to realize that it is not the world per se, but one's perception of the world that largely constitutes one's response to it. For example, "attribution theory" is a theory concerned with the way people perceive the causes of events and actions; "learned helplessness" is a condition of apathy, much like depression, that occurs when people or animals perceive that they no longer have control over what happens to them; even attitudes are often based on "stereotyping", whereby we place people into categories based on their (perceived) group identification. Perceptual biases, however, are often buried deep within the psyche, manifesting themselves as meaning in the form of emotional responses to perceived events. In this sense, emotions are the results, rather
than the causes of behavior (the James-Lange Theory of Emotions). In Polanyian terms, we could say that these perceptual biases are formed by the integration of subsidiary awarenesses. Subsidiary awarenesses exist at any level of consciousness, from subliminal to fully conscious, and are composed of all past experiences that have a bearing on what the knower is now focussing on (Polanyi, 1969, pp. 132-134), which is the meaning of the subsidiaries: "The boundless variety of raw experiences is devoid of all meaning, and our perceptual powers can render it intelligible only by identifying very different appearances as the same objects and qualities" (Polanyi, 1969, p. 114). Furthermore, "we can know a meaning only by a subsidiary awareness of particulars which jointly constitute the meaningful entity" (Polanyi, 1959, p. 57).

Psychology thus told me that in order to change meaning, one must first change perception, for meaning is a result of perception. Polanyi's philosophy showed me that this was a "philosophically correct" assumption. Due to the structure of meaning, one may change or alter only the subsidiary awarenesses, for it is actually the subsidiary, and not the focal (meaning) awarenesses that are bound by experience.

In what way then does it make sense to talk about
rendering an educational experience more meaningful? This question is raised by Daniel Pekarsky, who states that educationists must distinguish their use of this ambiguous term in order to enrich the meaning of the student's experience. Pekarsky elaborates on two senses of meaningful: the "personally significant" sense, and the "cognitively thick" sense (Pekarsky, 1982, p. 200).

These different senses of "meaningful" and their relation to "meaning" are important considerations, for they strike at the heart of current issues in education. For example, it is E.D. Hirsch's view that a specific curriculum will alone provide the shared background information necessary in understanding implicit meanings that are part of the development of interpretive skills indispensable to literacy. According to Hirsch, it is this mental background information that enables one to relate what is read to the unstated context that alone gives meaning to what is read. (Hirsch, 1986, p. 7)

In other words, Hirsch is saying that interaction with content can be made meaningful only if one first possesses the background information that allows him to relate stated content to unstated context. Shared background information is therefore, in Hirsch's view, a prerequisite to meaning. This view echoes Polanyi's
sense of the triadic structure of meaning, where background information would consti

tue the matter of subsidiary awarenesses. We can also find parallels of Hirsch's view (the importance of a specific curriculum in the educational experience of the student in order to understand implicit meanings that enable literacy) in the actual words of Polanyi. Polanyi says that, in reading a letter or text,

I am subsidiarily aware not only of its text, but also of all the past occasions by which I have come to understand the words of the text, and the whole range of this subsidiary awareness is presented focally in terms of the message. This message or meaning, on which attention is now focussed, is not something tangible: it is the conception evoked by the text .... Thus the meaning of a text resides in a focal comprehension of all the relevant instrumentally known particulars. (Polanyi, 1958, p. 92)

Although the topic of meaning will be discussed more fully in chapter 6, it has been raised here briefly as an example of the richness of Polanyi's work as a philosophical source in informing current educational
issues. His concept of "subsidiary awarenesses" explains what happens to "forgotten" facts in learning. It can even be said that in order to know, in Polanyi's sense, one must forget the facts, at least to one's focal consciousness. His theory of tacit knowledge explains, however, how this "forgotten" knowledge may continue to function in experience, even if it is not able to be recalled.

What can this tell us about decisions concerning educational programs and curriculum, when we consider that many such decisions are based on a variation of the theme that "facts are irrelevant", because they are soon forgotten and/or obsolete? (This topic will be discussed in chapter 4.) Also, what can Polanyi's assumptions regarding the nature of reality tell us about the importance of knowledge and the nature of knowledge, and, as bearers of "formal" knowledge, the role of educationists in the passing on of this knowledge? (This will be discussed in chapter 7.)

A good theory of knowledge such as Polanyi's is necessary in order to properly inform important educational decisions, primarily because education is not only concerned with learning, but is primarily concerned with knowledge. I have chosen Polanyi's theory because of the beauty
and clarity, richness and relevance of his thought.

In a recent computer search I had done to link Michael Polanyi with such a broad term as "education", a smattering of fewer than twenty articles turned up. I feel that his ideas deserve to be more widely acknowledged in education.
Michael Polanyi's Philosophy

Chapter 1: Rationality and Reality

Introduction. The idea that different basic assumptions about the world underlie different cultures is not new, and most of us have probably encountered the idea in an anthropology course or text. Furthermore, we have probably all heard about the underlying subjectivity of even the most objective perspective. (For example, we have been warned of the dangers of ethnocentricity.) One could almost say that education teaches us to believe that the difference between an educated person and an uneducated person is that an uneducated person has opinions, but should have reasons, whereas an educated person should have neither, for his reasons may smack of ethnocentricity.

There is an incoherence here. The world view advocated by science has so engulfed us in its moral neutrality that we are afraid to even turn and look at our neighbour, in fear that we may actually see something to which our naive and uneducated humanity may respond. Objectivism has led us down the yellow brick road, and now some of us want to come back.

At least that's what Polanyi feels, and his philosophy is trying to show us the way back—but without losing everything we have gained along the way. He just wants
science to adjust some of its fundamental assumptions concerning the nature of human beings in relation to knowledge. These assumptions have already been acknowledged as problematic in science, yet they have been ultimately ignored. As a scientist, Polanyi doesn't only want to save us; he wants to save science too.

This is basically the philosophical background in which Polanyi's philosophy sits. It is a background that is composed of objectivist aspirations that run through the fabric of scientific philosophy and that, according to Polanyi, are threatening to destroy the very structure of science. This is because the objective cloak of formal science is bothered by loose, hanging threads that science chooses to ignore. One of these threads is the fiduciary framework of scientific knowledge. According to Polanyi (1958):

Nobody has ever affirmed the presuppositions of science by themselves. The discoveries of science have been achieved by the passionately sustained efforts of succeeding generations of great men, who overwhelmed the whole of modern humanity by the power of their convictions. Thus has our scientific outlook been moulded, of which these logical rules give a highly attenuated summary. If we ask
why we accept this summary, the answer lies in the body of knowledge of which they are a summary. We must reply by recalling the way each of us has come to accept that knowledge and the reasons for which we continue to do so. Science will appear then as a vast system of beliefs, deeply rooted in our history and cultivated today by a specially organized part of our society. We shall see that science is not established by the acceptance of a formula, but is part of our mental life, shared out for cultivation among many thousands of specialized scientists throughout the world, and shared receptively, at second hand, by many millions. And we shall realize that any sincere account of the reasons for which we too share in this mental life must necessarily be given as part of this life. (p. 171)

Practically speaking, this means that before a scientist can discover something, he must first believe that it is there. This is because science represents a system of beliefs to which the scientist is committed.

What would be the justification for knowledge that is founded on such belief? Furthermore, if the roots
of discovery are belief, then this means that scientists personally participate in the shaping of knowledge.

How do scientists know when to accept one theory and discard another? Scientific evaluation of theory is not only based on the weight of empirical evidence or counter-evidence. This can be seen in the history of scientific thought, as, for example, in the widespread acceptance of Einstein's theory of relativity in the face of, relatively speaking, very little supporting evidence at the time of its proposal.

What are the rules that guide scientific behaviour, especially in the areas of invention, discovery, and evaluation? If discovery and invention are rooted in belief, and if evaluation is rooted in judgment, as Polanyi suggests, then it seems logical to conclude that scientific knowledge is not objective, as it claims to be, but is subjective, as it depends on the personal participation of the scientist.

These are the loose threads that, if pulled, threaten to unravel the whole fabric of science. In a sense, Kuhn pulled one of these threads when he said that science was a form of "irrational mob rule". The only way around the dilemma is to break with the either-or dichotomy: either objective or subjective. In breaking with this dichotomy, one can then say that
although knowledge can be shown to be subjective, in the sense of observer-attached, it does not necessarily follow that such knowledge is not objective. Let us say that it may or may not be objective. This implies the need for a re-definition of the concept of objective that would not be based on a criterion of personal detachment, but on some other criterion.

This is the thread that Polanyi picks up and begins to weave back into the fabric of the scientific structure. Polanyi re-defines the notion of objectivity in two steps: first, he accredits the notion of personal participation in the form of judgment, belief, and commitment as an essential feature of all knowledge, and second, he defines objective as true, rather than as observer-detached. Thus, what is truly objective is what is objectively true. In this way, although knowledge is subjective, in the sense of observer-attached, it may at the same time be objective, in the sense of true. On the other hand, such knowledge may also be not-true or mistaken, and in this case, although it is subjective in the sense described above, it is not objective. (Polanyi would call this subjective or idiosyncratic knowledge, as opposed to personal knowledge.)

Polanyi's re-definition of objective effectually re-defines the problem. We are no longer looking for a
rule or formal criterion for the designation of objective, but rather, for the designation of true.

This is the part of Polanyi's philosophy that gets rather tricky and complicated. In a sense, it represents a pivotal point in the understanding of his philosophy and, I suspect, in the acceptance of it. This is because Polanyi's criterion for the designation of true (which is rational) ties what is rational in theory to what is rational in reality.

Since knowledge is tied to reality for the designation of true and hence, of objective, then the formal rationality of theory to which scientists respond must actually, Polanyi says, reflect what is rational in nature for knowledge to be designated objective.

The basis of Polanyi's argument is that scientists respond to an essential quality of rationality in theory, and that reality is inherently rational, independent of humankind, and essentially indeterminate in its manifestation. Man's rational, tacit powers enable him to recognize this rational, independently-existing reality, and to re-construct facets of it through rational theory. The development of man's tacit intellectual faculties into rational powers is, to Polanyi, the key that opens the door to true objectivity in knowledge.
The purpose of this chapter will be to describe the problem of objectivity in science, to present Polanyi's solution to the problem, and to state Polanyi's underlying assumptions regarding the nature of reality. The aim will be to amplify the theme of rationality that can be drawn from Polanyi's work, and that actually supports his whole theory of the tacit.

An understanding of Polanyi's philosophy of objectivity (this chapter), and the nature, purpose, and function of human mental life (chapters 2 and 3) is a necessary background for the educational implications that will be discussed in subsequent chapters.

Subjectivity and Objectivity. In an article describing how Polanyi's philosophy can be applied to the philosophy of science, John Brennan (1977) begins by identifying the underlying problems in the philosophy of science (epistemological indeterminacy and the social nature of science), and then identifies the root of these underlying problems as the basic philosophical problem of surplus content. An example of the problem of surplus content can be stated thus: how do we account for our knowledge of a table and a chair as compared to our knowledge of right and wrong? What more than strictly sensory perception is known in the knowledge of such distinctions? Another example Brennan gives is the logical consistency
in maintaining moral judgments, whereby the cognitive content manifested in such consistency cannot be reduced to matters of fact and logic (1977, pp. 141-142).

What is the nature of this surplus content, this "extra" knowledge, whereby a theoretical statement is not equivalent to a set of observation statements? Furthermore, if theoretical statements are not equivalent to sets of observation statements, there can be no explicit rules to determine adherence to a theory or hypothesis in the face of experimental failure. (We will see in chapter 3 that such determinations are accomplished by what Polanyi calls the intellectual passions, by virtue of their nature and function.)

If there is no observational evidence strictly for or against any scientific hypothesis, then, Brennan concludes, science is actually detached from its empirical foundations (epistemological indeterminacy), and that which cannot be decisively determined must be relegated to the realm of subjective, and described as such (the social nature of science).

If there are no rules to guide a scientific performance, such as evaluation, then the evaluation is accomplished without rules. If scientists can and do make correct evaluations of the import of observational data, either confirming or falsifying them, then there
is a difference between rationality and formal inference. Brennan concludes that rationality must be a capacity that people possess, for its lack of explicitness means that it can't share the impersonal objectivity of a math formula, and that, if we accept science, then we must accredit persons with rational powers to make science possible (1977, p. 142).

Accrediting people with rational powers is what Polanyi's philosophy is all about. Unlike most philosophies of science and knowledge, the notions of rationality and personal participation in knowledge are embraced by Polanyi; in other words, his conceptual framework incorporates these ideas within his theory of knowledge. Furthermore, the notions are placed in a central position by being designated as legitimate and necessary features of all knowledge. The key to how he does this is contained within Polanyi's conception of subjective and objective. In the case of subjective, Polanyi distinguishes between personal and subjective; and in the case of objective, Polanyi re-defines the whole notion of objective in light of the personal.

The distinction between subjective and personal, and the re-definition of objective allows us to continue to speak of knowledge as objective without forfeiting
scientific legitimacy, while simultaneously addressing the problem of "extra" knowledge. No philosopher and no philosopher-scientist had ever done this before Polanyi. However, although Polanyi was the first philosopher to embrace tacit (unformulated, unarticulated) processes within a theory of knowledge by stating how they function, H. Prosch points out that the inclusion of tacit elements in philosophy actually goes back to the classic philosophers, namely, Plato, Aristotle, and Hume (1973, p. 201). Although none of these philosophers stated that all knowledge must have a tacit dimension, as Polanyi has done, Prosch shows how this tacit dimension has in fact been "tacitly" assumed in each of their epistemologies. (Consequently, Prosch sees no reason why the explicit inclusion of tacit should come as such a "shock" in philosophy, to the point where, he claims, Polanyi's work is not being given the careful attention that it deserves.) The following is one of Prosch's examples of tacitly assumed assumptions of the tacit in the philosophy of Plato (1973, pp. 203-205).

According to Plato, since the world of experience—the sensible world—is always in a state of flux, true knowledge must be something eternal. Plato calls such eternal knowledge Forms or Ideas. These Forms or Ideas
are never in the things of the world of becoming. Ideas can thus never be rendered explicit. Thus, the Idea of a circle is not identical with its word or definition, although our knowledge (the idea in our mind) more closely resembles the Idea of a circle than words, images, or definitions. The implication is that knowledge doesn't exist in explicit formulations, but only in our minds.

Even language can only manage to state an attribute, and not an essence of an Idea. That is why, to Plato, we can only grasp Ideas by dialogue and discussion, as we play words and definitions against each other in the hope of sparking the Idea. Knowledge is thus personal, in the sense that it must be seen and judged for oneself. In this sense, knowledge of Ideas and Forms must be tacitly grasped. Pure Form is intangible; in the mind and in the world, the form imitates the Form. When we judge an idea as true or correct, it is because of our recognition of its resemblance to the real Idea or Form, which is the object of our intention—as, for example, how we know a name we thought of as the one we wanted to recall. We know it from the start well enough to know when we have found it. We know it implicitly, but not explicitly. To Plato, Forms are potentials in man's
reason. To see them more clearly, man must come to know himself.

The implication that Prosch draws from the work of Plato is that man dwells in the Ideal subsidiarily, and can thus never see it focally. The difference between Polanyi and Plato, according to Prosch, is that to Polanyi, tacit processes create forms, for the world of organic nature is viewed as open by Polanyi whereas, to Plato, the tacit processes uncover them.

I would not quite agree with this latter distinction between the work of Plato and Polanyi, however, for although it is true that Polanyi views organic nature as open and becoming, what is pertinent to the analogy is how Polanyi views reality. Consequently, I would say that Polanyi's view of reality (to be discussed in the following pages) is analogous to Plato's view of Forms and that, like Plato, Polanyi feels that man's rational powers are capable of uncovering reality (Forms to Plato) by means of tacit processes.

I would compare Polanyi's view of the creation of forms (small 'f') in an open world of organic nature to Plato's conception of ideas or forms (small 'i' and 'f') in the world of things or becoming.
Subjectivity, Objectivity, and Personal Participation. Polanyi claims that the participation of the scientist (or knower) in the shaping of knowledge through his belief, judgment, and commitment is unavoidable. However, commitment, judgment and belief are unformulated components of knowledge and as such, they actually reveal the tacit or unformulated nature of personal participation. Thus at first glance, it may seem that Polanyi's idea of the participation of the knower in the shaping of knowledge constitutes the type of subjectivity that objectivist science seeks to avoid. However, although participation of the knower is personal and tacit, in the sense of observer-attached, it does not follow that this participation is subjective—and that is Polanyi's main premise.

I deny that any participation of the knower in the shaping of knowledge must invalidate knowledge, though I admit that it impairs its objectivity .... tacit knowing is in fact the dominant principle of all knowledge. (Polanyi, 1959, p. 13)

As we will see in the following pages, how participation can be personal and unformulated without being subjective is due to what Polanyi claims to be the essential feature
of both objective knowledge and reality: an underlying rationality. It will also be seen that this feature of rationality is at the heart of Polanyi's definition of the concept of objective.

Being a scientist himself, Polanyi is certainly not intending to discredit the ideal of objective knowledge. Rather, he is seeking to discredit the ideal of an objective knowledge that is knower-detached:

Let us recognize that tacit knowing is the fundamental power of the mind, which creates explicit knowing, lends meaning to it and controls its uses. Formalization of tacit knowing immensely expands the powers of the mind, by creating a machinery of precise thought, but it also opens up new paths to intuition; any attempt to gain complete control of thought by explicit rules is self-contradictory, systematically misleading and culturally destructive. The pursuit of formalization will find its true place in a tacit framework. (1969, p. 156)

Polanyi manages to keep within the bounds of an objectivist framework while building his tacit theory because he makes changes from the inside out—that is,
by modifying the concept of objective from within the framework of science. He does this in the following manner.

First of all, Polanyi acknowledges personal participation in science by giving examples of where this participation can be seen. Polanyi then re-defines the notion of objectivity in theoretical knowledge so as to include an account of this tacit, personal dimension within its definition. In this way, personal participation becomes accredited, and not merely acknowledged.

Polanyi's Conception of Objectivity: Rationality and Truth. Polanyi claims that there is objectivity in theoretical knowledge, and that it is to be valued. However, Polanyi is not suggesting that we value objectivity in the sense that modern science does, which is "in the sense that its substance is entirely determined by observation, even while its presentation may be shaped by convention" (Polanyi, 1958, p. 16). It is clear that this sense of objectivity places a higher value on the senses than on reason.

In contrast to the scientific, objectivist sense of theoretical objectivity, Polanyi's sense of objective places rationality at the core of theory: "We abandon the cruder anthropocentrism of our senses--but only in
favour of a more ambitious anthropocentrism of our reason. In doing so, we claim to formulate ideas which command respect in their own right, by their very rationality, and which have in this sense an objective standing" (Polanyi, 1958, p. 4).

Polanyi isn't suggesting that we put rationality back into the current scientific sense of objective. He's saying that it is already there, whether science acknowledges it or not. (This is another example of a "loose thread" in science referred to in the introduction to this chapter.) Polanyi gives the example of scientists' use of words like simplicity, economy, and symmetry to describe the greatness of a theory. In using these words, scientists think they're maintaining an objectivist framework, but in fact, Polanyi claims, the words actually stand for the essential quality of rationality in one's appreciation of theory (1958, p. 16).

If scientists respond to and evaluate the quality of rationality, then there must be some ultimate standard or criterion against which it is being evaluated. (It cannot be a relative standard, like more economical or most simple, for these are subjective standards that say nothing of the functionally objective value of the theory being evaluated.)
Polanyi says that when scientists use words like simplicity and economy, they are really using these words to express standards of rationality that resonate with truth: "They must stand for those peculiar intellectual harmonies that reveal, more profoundly and permanently than any sense-experience, the presence of objective truth" (Polanyi, 1958, p. 16).

Thus the concept of objective, to Polanyi, means that there is a correspondence between the rational in theory and objective truth. The full definition of objective then, would not only describe a set of empirically provable statements or probabilities about the past or future but, to Polanyi, must also include the notion of truth. Furthermore, without the personal participation of the knower, the presence of this truth in theory could never be discerned. Yet, our commitment to theory is a tacit, unformulated act of judgment, in the sense that it involves appraisals of whether or not the theory is bringing into focus what we sense is out there, but are unable to clearly see (more of this process will be discussed in chapter 2). The point to be made here is that the relationship between rationality and reality (what we sense is out there) forms part of Polanyi's conception of scientific
activity, yet at the same time reveals assumptions about reality that are at the heart of Polanyi's philosophy.

Rationality and the Nature of Reality. To Polanyi, the power of any theory lies in its rationality. Theory is like a screen between our senses and what is impressing them. We tend to rely on theory to interpret experience because theory, Polanyi says, asserts its own rationality, and can thus lead us beyond experience to understanding. Theory inspires us "with the hope of overcoming the appalling disabilities of our bodily existence, even to the point of conceiving a rational idea of the universe" (Polanyi, 1958, p. 5).

Although it seems as though Polanyi might be referring to the same type of objectivity as found in Karl Popper's "World 3", the difference between Polanyi and Popper lies in the origin of this objectivity. The origin of Popper's World 3 is the mind of man, whereas the origin of Polanyi's objectivity is a reality that is independent of man's mind, but that is capable of revealing itself to the mind of man. Although the level of reality that Polanyi is referring to in the justification of rational theory in terms of objective truth originates outside of man, Polanyi's conception of reality and man is actually multi-levelled and thus does, at a higher level,
suggest a comparison between his higher-level noosphere and Popper's World 3 in terms of origin. However, Polanyi's noosphere and Popper's World 3 can still be shown to be different, but this time, different in terms of intent and purpose. Polanyi's noosphere is an affirmation of man's ultimate aims, and represents the external pole of his commitment (1958, p. 404). It is brought into existence by the mind searching for something believed to be real (1958, p. 396). In contrast, Popper's World 3 contains no notion of emergence out of human intent and purpose, but rather, as an unintended consequence of activity (Magee, 1973, p. 60). Human aim and purpose are thus secondary to World 3 emergence, not primary, as in Polanyi's noosphere.

Polanyi says that reality can be contacted by the rational in man recognizing what is rational in nature (1958, p. 6). The implication is that reality is external, rationally governed, and hidden, yet accessible to man.

The fact that rationality can transcend sensory experience is an important feature, since one of Polanyi's main premises is that reality cannot be contacted by sensory impressions alone (1958, p. 5 & 1969, p. 133). It is an "external reality gradually accessible to knowing" (1969, p. 133).
However, we can't know ahead of time how much truth our theory will reveal: "Our theory may yet show forth its truth through future centuries in ways undreamed of by its author" (Polanyi, 1958, p. 5). This is because reality "may yet reveal itself to our deepened understanding in an indefinite range of unexpected manifestations" (Polanyi, 1969, p. 133).

The preceding statements refer to Polanyi's theme of the fundamental indeterminacy of knowledge, for it bears on a fundamentally indeterminate reality:

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. (Polanyi, 1969, pp. 119-120).

Knowledge may thus be regarded as determinate, in the sense that it is defined by an independently existing reality; yet knowledge may also be regarded as indeterminate, in the sense that it bears on a reality that is capable of revealing itself in a variety of indeterminate ways. The indeterminate sense of knowledge is the one that
Polanyi endorses for the following reasons.

If truth lies in the bearing of a proposition on reality, then efforts to completely spell out, or formalize the implications of this truth must fail, for:

The indeterminate cannot be spelt out without making it determinate. It can be known in its indeterminate condition only tacitly, by those tacit powers by which we know more than we can tell. (Polanyi, 1969, p. 172)

The fundamental nature of all knowledge is thus indeterminate, for it bears on a reality that is capable of revealing itself in indeterminate ways: "True knowledge bears on an essentially indeterminate reality..." (Polanyi, 1969, p. 155). Consequently truth, or the bearing of knowledge on reality, can be known only tacitly, in an unformulated manner, as it is revealed in various ways to man's understanding.

Knowledge, Knowing, and Rationality. The foregoing account of Polanyi's re-definition of objectivity, which included the notions of personal participation and objective truth, also revealed Polanyi's fundamental assumptions concerning the nature of reality. Reality is rationally governed, indeterminate, independent of
man, and hidden, yet accessible to man. These assumptions underlie Polanyi's entire theory of human knowledge. Yet, although Polanyi's theory of knowledge rests on these assumptions and is sustained by them, both theory and assumptions can actually be seen to coincide at one main point—the point of rationality.

We have already seen that Polanyi ascribes to the inherent rationality of both theory and nature, or reality, and we have only to read the opening lines of "A Study of Man" to appreciate Polanyi's "rational" conception of man: "Man's capacity to think is his most outstanding attribute" (1959, p. 11).

Rationality is thus the "crystal core" of Polanyi's work. As such, it is both the invisible wellspring (in the tacit domain) and the visible fountainhead (in the explicit domain) of his whole theory of human knowledge.

The reader may question how rationality can be a feature of the tacit domain, a domain that is characterized by its informal nature. It is because the tacit is the only domain where man can contact reality—due to the indeterminate nature of reality. But since reality is also, by nature, inherently rational, then the tacit can be characterized as rational insofar as it is in contact
with reality. This contact refers to the criterion of objective truth which, due to the fundamental indeterminacy of knowledge, can only be fully appreciated over time.

It is, in fact, the coincidence between the rationality in man and in nature that seems to account for Polanyi's entire elaboration of the components of explicit, formal knowledge down into their tacit roots, so as to include the notion of tacit within our understanding of all knowledge, even formal. For all formal knowledge rests on a contact between man and reality that occurs in this informal, tacit domain; and all formal knowledge that is considered truly objective rests on the assumption, the belief, and the hope that this contact has indeed been made.

The question of the origin of human knowledge has troubled philosophers for centuries— at least since the time of Descartes. Rationalists concluded that true scientific knowledge is derived from reason, rather than from the senses. David Hume argued against either reason or the senses as being the source of human knowledge, and claimed that all we can be sure of is that observation and sense-experience can show us patterns of regularity (scientific laws) that occurred in the past, but that will not necessarily occur in the future. (Wolff, 1981, p. 341)
From all of the preceding discussion concerning the core of rationality that can be found in Polanyi's philosophy, one may be tempted to infer that Polanyi is a rationalist. Joseph Agassi claims that Polanyi's philosophy is an "irrational version of rationalism" (1973, p. 395). Prosch, however, claims that Polanyi is an empiricist (1973, p. 205), and we find evidence of empiricist leanings in Polanyi's own words: "The way the body participates in the act of perception can be generalized further to include the bodily roots of all knowledge and thought" (Polanyi, 1969, p. 147).

The confusion seems to be legitimate for, as N. Greene points out, Polanyi's whole theory of tacit knowing is an important source of overcoming the conception of mind as separate from body, yet, she says, Polanyi himself did not see the problem as one of overcoming Cartesian dualism, but of defending it. Greene concludes that Polanyi "gravely misunderstood his own place in contemporary philosophy" (Greene, 1977, p. 169).

I feel that although Polanyi's philosophy can be considered either rationalist or empiricist, one of the key arguments in moving away from viewing him as an empiricist towards viewing Polanyi as a strict rationalist is the theme of transcendence. Although this particular
theme is not specifically developed by Polanyi, it is nevertheless seen often throughout his work: for example, the transcendence of the subjective through commitment to universal standards, transcendence of the logical level of observer in the act of knowing through the process of indwelling, transcendence of the objective through art and mysticism.

Furthermore, although Polanyi's version of rationalism initially calls for a framework of belief (the irrational, or a-critical component of his rationality), this framework is ultimately transcended within a rational framework, by the justification of belief through the verification of knowledge. Yet, as Mays points out, Polanyi at all times distinguishes intuitive aspects of thinking from the logical criteria used in testing its results:

In examining Polanyi's thought, one thing is certainly clear: he cannot be accused of psychologism, as he refuses to identify logic with psychology. He tells us that no study of thought or the socio-physical context in which it occurs, can reveal whether a particular deduction, for example, a proof of the binomial theorem, is correct or not.
The correctness of such a proof can only be supported by logical reasoning. (Mays, 1978, p. 49)

The "irrational" component of Polanyi's rational philosophy thus need not be a case for "reason versus faith" (even though Polanyi does see faith, or belief, as the basis of reason), for, to Polanyi, because belief is transcended within a rational framework, experience need not be separate from reason. (It must be noted that the origin of belief to Polanyi is social, cultural, and intellectual experience.)

Furthermore, in grounding his philosophy in belief, which can be transcended, Polanyi is effectively grounding experience in reason, which gives it (experience) meaning. In chapter 6, we will see how qualities such as meaning and appreciation are emergent characteristics, and how these characteristics figure prominently in the relation between "methods" in education, and the "educational experience".

Rationality and Reality: A Summary. Polanyi's conception of "objectivity" in theoretical knowledge is bound up with a conception of "rationality", and can be summarized as follows.

Rationality transcends sensory experience. It is thus capable of making contact with independent,
inherently rational reality.

Rationality is at the core of scientific theory and thus, man's theory is capable of describing reality—in other words, of leading man to a knowledge of objective truth. The process is recognition: the rational in man recognizes the rational in nature. This implies a tacit, unformalized operation.

There is another reason why the objective truth of knowledge (its bearing on reality) can only be known tacitly. This other reason has to do with the nature of knowledge. Knowledge is fundamentally indeterminate, for it bears on a reality that is itself fundamentally indeterminate—capable of manifesting itself in a variety of ways.

Because reality is external and independent of man, its "clues" attract man's attention, enticing him to both extend and guide the formal limits of rational theory by means of the informal, heuristic parameters of his tacit knowing. This is what Polanyi means by personal participation in knowledge. He means that man shapes and guides formal knowledge through his informal, tacit powers of mind—powers which enable him to direct and build theory through appraisal of its truth, or its bearing on reality. Consequently, the more "objective" a theory is (the more
it bears on reality), the more indeterminate will be its "true" implications, due to the indeterminate nature of the reality on which it bears.

The next chapters will discuss how the informal, tacit powers of mind function (chapter 2), and the nature, roots, and manifestation of these tacit powers and their complementary intellectual passions (chapter 3).
Chapter 2: Man's Vision of Reality: Knowing & Knowledge

Introduction. The knower's personal participation in the shaping of knowledge was defined in chapter 1 as specific components of formulated acts in scientific activity—components such as appraisal, judgment, and commitment. These components that shape formal knowledge reveal the tacit nature of human participation in the shaping of knowledge. Because these components cannot be formulated, due, as we have seen, to the fundamental indeterminacy of knowledge, they shape formulated knowledge heuristically, by guiding it, directionally, towards a knowledge of objective truth. This is one way that the tacit functions: it orients, or directs the growth of formal knowledge.

In addition to the tacit functioning as a directional component that shapes all formal knowledge, there is another instance of tacit functioning that is characterized as more than a directional component. This is the instance of knowing itself. (By "knowing", Polanyi means understanding, discovering, inventing, grasping meaning, performing a skilled act—in short, any act of the mind or body that exhibits what he describes as the characteristic structure of the act of knowing.)

The act of knowing is an entirely tacit, unformulated
act, in contrast to formal knowledge which has only tacit components. The distinction enables us to see even more clearly what Polanyi means by tacit.

**Tacit** may refer to an entirely informal process within a formal structure of an act of knowing, or it may refer to an informal component within a formal structure of knowledge that accounts for the direction that knowledge takes.

The purpose of this chapter will be to elaborate on these two ways of tacit functioning: (a) how the tacit functions in acts of knowing, and (b) how the tacit functions in formal knowledge. In relation to (a), the following Polanyian concepts will be discussed: indwelling, particulars, subsidiary and focal awarenesses, and the concept of unspecifiability. In relation to (b), Polanyi's conception of foreknowledge and conceptual frameworks will be discussed.

The distinction between these two ways of tacit functioning will enable us to formulate a definition and thus, a distinction, between the subtly interwoven concepts of tacit knowledge and personal knowledge, which will be given in the summary of this chapter.

The educational implications of the concepts discussed in this chapter will include: how the tacit functions
in the act of knowing in relation to the aims and uses of schooling (chapter 4); the function of conceptual frameworks in relation to the ideal of value neutrality in educational decisions (chapter 5); and the functioning of the tacit in relation to the practical application of the concept of tacit knowledge in education (chapter 8).

(A) Tacit Functioning in Acts of Knowing.

Introduction. Webster's dictionary defines tacit in the following manner: silent; implied, but not expressed in words. This definition allows for the use of the word tacit as discussed in chapter 1: that is, as a directional component of all formal knowledge—for what cannot be expressed in words can still be expressed in another form (in this case, as a direction or orientation towards a knowledge of objective truth).

In the case of knowing, the direction or orientation is manifested in the very structure of the act of knowing: the from-to structure that characterizes any and all acts of knowing.

What Polanyi means by a from-to structure is the following: in the act of knowing, the knower integrates features, or particulars, of a situation, object, or event into a comprehensive entity. In the act of integration, the knower is looking from these particulars to the focus
of his attention, the comprehensive entity. This integration demands effort on the part of the knower, and it is this "...effort of integration which achieves knowing" (Polanyi, 1969, p. 134). The act of integration that occurs as the knower attends from particulars to the focal object of his attention is what Polanyi calls tacit knowing (1969, p. 140).

The main point is that knowing is an act or a process of integration whose structure displays a from-to orientation. The one essential feature involved in any and all acts of knowing that accounts for this structure is that attention is given to particulars subsidiarily, which means, in terms of their participation in the whole (the focal object or comprehensive entity).

According to Polanyi, it is possible to attend to particulars in two ways: either focally or subsidiarily. A subsidiary attention to particulars achieves integration, or tacit knowing, whereas a focal attention to particulars dissolves the integration. (The now almost "classic" example is the pianist whose performance comes to an abrupt end as he shifts his attention from his overall performance—the comprehensive activity, or focal object of his attention—and focusses instead on his fingers, or the notes on his music sheets—the particulars, or individual
features of the comprehensive performance). There is not necessarily a change in the degree of attention given to particulars, but a change in the kind of attention or awareness—focal or subsidiary (Polanyi, 1969, p. 128).

Thus, whether performance is of mind or of body, the act of knowing or doing (which includes acts of knowing how, such as playing a piano or swimming or riding a bike) entails an integrated performance.

Subsidiary awareness of particulars also implies that attention is being given to the particulars in a functional way. The knower is using the particulars in order to achieve an integrated performance or focal awareness. Using particulars to attend to the whole of which they are a feature or a part is another way of saying that one is subsidiarily aware of them.

Polanyi's specific term for the process involved in the act of knowing—or the act of integration—is indwelling. Indwelling is a particular state of mental existence (Polanyi, 1969, p. 134), whereby the knower "dwell[s] in" a set of particulars. This means that he uses the particulars in a functional way as described above. He uses them as he would use a part of his body to achieve an integrated performance. For example, if I use a pencil to write, I am subsidiarily aware of the pencil and my
hand, whereas I am focally aware of the words I am writing. I am using my pencil as I am using my hand (as well as any other particular involved in writing, such as language and graphics). I am dwelling in the set of particulars (pencil, hand, language, etc.).

**Indwelling and Particulars.** The process of indwelling achieves knowing. Indwelling is a singular, comprehensive act that is performed over and over again as sets of particulars, or frameworks, are modified. The purpose of indwelling is to make sense of experience by integrating features of a situation in a coherent manner. In this way, understanding "unfolds". Frameworks, or sets of particulars, can thus be said to be interpretive schemes, since they provide a framework for interpreting experience. As these frameworks become more complex, understanding implies grasping the principles of integration, or what rules or joint meanings join sets of particulars together into coherent patterns, or frameworks.

The important point concerning the concept of indwelling is that one must utilize a framework in order for understanding to unfold, and that the process of utilizing a framework is what Polanyi calls "indwelling" (1969, p. 134).

Indwelling is, to Polanyi, an existential acceptance of what we rely on to make contact with things we observe as
objects outside ourselves (Polanyi, 1958, p. 59).
We rely on what we have accepted by using the standards
and indications of the framework as interpretive tools;
in other words, tools which remain on "our side" of the
distinction between observer and object being observed,
and not somewhere out in the "field of operation".
In this way, we assimilate the tools as parts of our
own existence. We have accepted them existentially by
dwelling in them (Polanyi, 1958, p. 59).

How indwelling is achieved— that is, how an object
is transformed into a tool—is analogous to the absorption
of a part into a whole. The process is shown by Gestalt
psychology: it is the deliberate merging of awareness
into a focal awareness of a whole (Polanyi, 1958, p. 57).
It is an intentional, deliberate act (Polanyi, 1958, p. 57).
The deliberate merging of awareness of relevant particulars
into a focal awareness of a whole constitutes the act of
knowing.

The Nature of Particulars. The nature of particulars
is varied. The effort of integration that achieves
knowing relies on (1) stimuli coming from outside, from
all parts of our body, and from tools or instruments
assimilated to our bodies, as well as (2) a wide range
of linguistic pointers which bring to bear our
preconceptions, based on past experiences, on the interpretation of our subject matter (Polanyi, 1969, p. 134).

Consequently, a particular may be an internal message that keeps our body and head in its position or it may be a memory of a past instance (Polanyi, 1969, p. 126-7), or a particular may be knowledge acquired through education (Polanyi, 1958, p. 103). Particulars are known data (Polanyi, 1958, p. 127). They are awarenesses that are selected from our individual fund of awarenesses because of their relevance to what we are focussing on. (Although all particulars are known, we will see that they are not necessarily specifiable. Thus, some particulars may be known only in the tacit sense.)

Because, as we have seen, particulars are functional, it is "logically" impossible for us to be aware of a particular in any other manner than subsidiarily in the context of the act of knowing or doing. Outside the context of knowing or doing, however, we may or may not be able to specify a particular. In other words, we may be aware of some particulars only subsidiarily, in the act of knowing or knowing how (a skill). In this case, if we are unable to specify a particular outside the context of knowing or doing, then this particular (or particulars or sets of particulars) would form part
of what Polanyi refers to as **tacit knowledge**.

Tacit knowledge is knowledge that we possess or know, but that we are aware of only subsidiarily, or functionally, in the performance of an act of doing or knowing. We may not be aware of our tacit knowledge specifiably, or focally, either because: (a) we have not made these tacit components of our acts of knowing or doing explicit through analysis, or the detailed breaking down of the components of a composite whole. For example, we may know how to paint beautifully, using correct techniques, such as foreshortening, without ever having formally learned the techniques. We may have picked up the technique(s) informally, through observation, imitating, and engaging in the activity of painting. In this case, the tacit knowledge we possess is able to be specified (the technique of foreshortening forms part of the body of knowledge we have of art), although we ourselves may remain quite ignorant of this formal, explicit knowledge.

We may also not be able to be aware of some of the particulars of our knowledge because (b) some tacit components of our acts of doing or knowing cannot be made explicit, even through the process of analysis. This is because analysis cannot reveal all knowledge. Some knowledge can only be gained by experience.
For example, a doctor may correctly diagnose a disease that has symptoms in common with many other diseases, but that has no one feature that is particular to it. Hence, it is only the knowledge that the doctor has gained through experience that leads him to a correct diagnosis in such cases (Polanyi, 1969, p. 132). According to Polanyi, "practical skills and practical experience contain much more information than people possessing this expert knowledge can ever tell" (1959, p. 33).

A summary of the main points concerning the nature and function of particulars follows.

Particulars may be given by experience, and their nature is varied.

The one thing particulars have in common is that they are known to the person using them, whether or not he is able to specify them.

Within the context of knowing or doing: particulars are components, parts, or features of a whole—either an object, an understanding, or a performance.

Particulars function as clues, directing one's attention to the whole of which they are a part. By a mental effort, the knower directs his attention from the particulars to the object of his focal attention—what he is trying to see or understand or do. He is aware of the particulars
subsidiarily, in terms of their relation to the whole, which he is aware of focally.

Outside the context of knowing or doing, the same known data that are called particulars within the context of an act of knowing or doing are not called particulars outside that context. They are called either tacit knowledge or explicit knowledge, depending on their specifiability. Tacit knowledge is unspecified knowledge, and may in some cases be unspecifiable knowledge. In other words, it may remain tacit either due to the knower's personal limitations in the specification of his knowledge, or due to the limitations of articulation itself (language). On the other hand, explicit knowledge is both specified and specifiable knowledge. (The concept of specifiability will be discussed in the next section.)

It should be clear from the above that all knowledge, including explicit knowledge that has been assimilated, functions tacitly—that is, informally, in terms of its joint meaning or comprehensive entity; and unspecifiably, in terms of the particulars, or components of that entity, in any act of knowing or doing.

But if all knowledge is fundamentally tacit, as it is if it rests on our subsidiary awareness of particulars in terms of a comprehensive
entity, then our knowledge may include far more than we can tell. (Polanyi, 1969, p. 133)

The Concept of Unspecifiability. We often "know" something by recognizing the appearance of what we are looking at. In many cases, we may be able to recognize and identify a particular appearance without really being able to say how "this" particular one is different from "that" one. For example, we are able to recognize a face as familiar among all others, or a doctor may recognize the symptoms of one disease from another even when both diseases have common or similar symptoms, or a wine taster may recognize characteristics of wines. (These are all instances of the philosophical problem of "surplus content" discussed in chapter 1.)

Because of the nature of knowing, we know that "particular" features must be present in each of these cases, and that our recognition must somehow be based on an awareness of these features. However, if we try to specify exactly what all of these features are, we will at some point be lost. No matter how sophisticated our analysis may be, it will at some point break down, and we will be forced to say that we don't know how we know. Polanyi's philosophy shows that there are two reasons for this: one that is related to the nature of the act of knowing,
and one that is related to the nature of the particulars.

First of all, there is a fundamental limitation involved in the very act of knowing: the act of integration that achieves knowing is itself unspecifiable (Polanyi, 1969, p. 126). We have already seen why. The act of integration is unspecifiable because it is logically impossible to specify the particulars of our knowing while we are in the act of integration due to the fact that we are aware of the particulars subsidiarily, rather than focally. To give an example, let us say that we are looking at a physical object such as a bird. Although we are aware of the particular features that make up that object or comprehensive entity, we do not see the particulars as separate, but rather, in terms of their relation to the whole. Thus, in seeing the bird, we are aware of its wings and beak, not as separate features, but in their relation to the object of bird. Although we do not particularly focus on the features of the bird and thus cannot even say exactly what color the wings are or what shape the beak is, we know, nevertheless, that we are looking at a bird. But in order to know we are seeing a bird, we must rely on our awareness of its wings and beak. The type of awareness we rely on is subsidiary: that is, an awareness of the particulars (wings and beak) in terms
of their relation to the whole (bird).

Although this is a very simple example, the point is the following: under certain conditions or instances of knowing, it is logically impossible for us to specify the particulars of our knowing. This does not imply, however, that we don't know the particulars: "...like the knowing of unspecifiabies, a knowing of more than you can tell" (Polanyi, 1969, p. 131).

Although we don't know these particulars in the specifiable sense, we know them in the tacit sense—that is, subsidiarily, in terms of their function.

In addition to this fundamental source of unspecifiability due to the nature of the act of knowing, there is another source of unspecifiability that becomes apparent if we intentionally try to elucidate the particulars of our knowing. In many cases, we will find that we just cannot put our finger on these particulars, and that some of them remain elusive (as in our examples of the recognition of a face, or the diagnosis of a disease, or the recognition of wine characteristics). This second source of unspecifiability is due to the nature of the particulars and/or their relations.

If we intentionally dissolve the act of knowing and try to focus on the particulars in order to specify
them, we may find that we are unable to. Some particulars are unspecifiable. This occurs for at least one, and sometimes both of the following reasons.

First of all, there is always a residue of particulars left unspecifed (Polanyi, 1969, p. 124). This is primarily due to the fundamental indeterminacy of knowledge, which was discussed in chapter 1.

My definition of reality, as that which may yet inexhaustibly manifest itself, implies the presence of an indeterminate range of anticipations in any knowledge bearing on reality. But besides this indeterminacy of its prospects, tacit knowing may contain also an actual knowledge that is indeterminate in the sense that its content cannot be explicitly stated. (Polanyi, 1969, p. 141)

In other words, "...subsidiary awareness of a thing may not suffice to make it identifiable" (Polanyi, 1969, p. 142), as in the case of the recognition of a face or the diagnosis of a disease or the contraction of an eye muscle. In these cases, it may also be the relations between the particulars that render them unspecifiable. Unspecifiability due to the relations between particulars is even more apparent in the relations between the separate motions of a skill.
such as piano playing or swimming, or the working of our sense organs in visual perception (Polanyi, 1969, pp. 125-127). Closely related to the idea of unspecifiability of particulars due to relations between the particulars is that, even when particulars can be identified, isolation may change their appearance. This is because appearance varies with the context in which it is placed. For example, a particular color may appear to be different when viewed against different colored backgrounds (Polanyi, 1969, p. 124).

**Summary of the Concept of Unspecifiability.** Because we know unspecificals in the tacit sense, we can say then that tacit knowledge is the knowledge we have of whatever we *can't* specify (due to the unspecifiability of certain particulars and/or their relations), as for example, in skilful acts of doing or knowing, or, of whatever we are temporarily *unable* to specify (due to the nature of the act of knowing).

All knowledge then, and all knowing, is fundamentally tacit, and our knowledge may include far more than we can tell (Polanyi, 1969, p. 133).

The unspecifiability of particulars in tacit knowledge can be contrasted with the specifiability of particulars in explicit, formal knowledge, where one is always able to go back to the particulars of one's knowing that have
inductively lead to the knowledge. (Polanyi would refer to this difference as the difference between irreversible and reversible stages in acts of knowing. 1958, p. 76)

This chapter has so far described how the tacit functions in acts of knowing: the tacit integrates relevant particulars in terms of their joint meanings into comprehensive entities. The act of knowing has a characteristic from-to structure, and is achieved through the process of indwelling, whereby the knower utilizes a framework, composed of a given set of particulars, in order to achieve the coherence that characterizes knowing. It was seen that in the act of knowing, attention is given to the particulars subsidiarily, in terms of their relation to a focal whole. The process of knowing is a tacit, informal process, as it is a process that renders the particulars (on which knowing relies) logically, or formally, unspecifiable, at least within the context of the act of knowing. Subsequent analysis, whereby particulars are focussed on directly, may or may not render the particulars specifiable; the reasons were discussed in the preceding section which discussed the concept of unspecifiability.

The purpose of this chapter was to describe how the tacit functions. It was stated that the tacit functions
in two ways: in the act of knowing (just discussed), which is an entirely tacit act, and as a directional component in all formal knowledge, which will now be discussed.

(B) Tacit Functioning in Formal Knowledge.

Introduction. It can be seen from the preceding discussion on the concept of unspecifiability that the effects, or consequences of unspecifiability are two-fold: (1) unspecifiability both accounts for the fact that we can know more than we can tell, and (2) unspecifiability (knowing more than we can tell) determines the structure of knowing: an orientation from subsidiaries or particulars, to a focal or comprehensive entity.

It would seem that there is a feedback loop, a type of circular reasoning at the root of Polanyi's sense of knowing, whereby (a) the consequence of the act of knowing is unspecifiability, and (b) the consequence of unspecifiability is both the structure of the act of knowing, and the fact that we can know more than we can tell (or specify). Although one explains the other, it does not justify it.

Rom Harre recognizes the problem posed by the structure of tacit knowledge; he questions how tacit knowledge can exhibit a logical from-to structure when, in certain cases, knowledge is mediated by belief. He
gives the example of the discovery of the gas laws that was arrived at by imagination (belief), and not by logic. Harre suggests that Polanyi's from-to structure may have been intended to show how tacit knowledge is revealed, explicated, and made explicit. Thus, he says, we would not be using a from-to notion to reveal a logical structure in propositional knowledge, but to reveal a historical, dynamic process by which the knowledge was formulated. (Harre, 1977, pp. 172-177).

On the other hand, W.T. Scott claims that philosophers have a tradition of viewing discovery as a psychological, rather than a logical process. Scott suggests that Polanyi's analysis of integration, either in perception or in concept formation, is grounds for examining the process of discovery in terms that transcend a logic-psychology distinction (Scott, 1971, p. 32).

How, then, can we say that knowledge exhibits Polanyi's logical from-to structure, even in cases (such as discovery) where knowledge can be seen to be mediated by belief?

First of all, it is important to note that belief constitutes what Polanyi terms foreknowledge, and it is foreknowledge, as we shall see, that is the part of conceptual frameworks that is involved in the process of discovery. We shall also see that foreknowledge is a
type of "conceptual belief" that is not totally arbitrary, for it is tied to a framework of propositional knowledge. Consequently, foreknowledge does sit within a framework of logic, even though foreknowledge itself is non-propositional knowledge. It is thus possible to view the problem of belief from within Polanyi's philosophy without abandoning his from-to, logical structure for the process of discovery.

As noted earlier, there does seem to be a problem in using the from-to notion to describe a structure that is mediated by belief (a type of circular reasoning that explains the structure, but does not justify it). However, because of Polanyi's concept of foreknowledge, it is not necessary that we abandon his from-to structure as a model in resolving this problem. It is only important that we remember that Polanyi does not base his logic of tacit inference on inductive logic, but rather on the work of Gestaltists. In merging one's awareness of parts into a whole, the whole is greater than the sum of its parts. This suggests that an added quality is present in the whole that is dependent on the structure, but that is not revealed by it.

In the words of W.T. Scott:

An important philosophical aspect of the from-to character of perception lies in its
bearing on the conception of the world as composed of a hierarchical set of levels of complexity and organization. Even without the from-to relation, we know that the perceptual wholes are not reducible to their parts, and conceptual wholes are not explainable in terms of laws that apply to their constituents.

(Scott, 1971, p. 25)

In one sense then, we can view Polanyi's from-to structure as the revelation of a historical process of discovery that can only be viewed after the fact, as Harre suggests. However, in doing so, it is not necessary that we abandon the from-to notion as the revelation of a logical structure in discovery, for belief can be considered part of a logical framework insofar as it is rooted in propositional knowledge. This process will be clarified in the following discussion of foreknowledge.

Foreknowledge and Conceptual Vision. The concept of unspecifiability has been discussed, and the problem this concept presents regarding the from-to structure of the tacit act of discovery has been suggested. Because of the unspecifiability of particulars, knowing, including discovery, is a tacit act, whereby the knower must participate in the act of knowing. He does this by pouring himself into the
particulars (Polanyi, 1959, p. 62). This occurs through the process of indwelling, previously defined as a state of mental existence.

Although clues or particulars may point to things I do know, but have forgotten (as, for example, where I placed my pen), clues may also point to things I don't know, and from which I am trying to gain an intimation of the unknown (Polanyi, 1958, p. 126).

To Polanyi however, looking at the unknown really means that one is looking at the known data, but not in themselves (1958, p. 127). As we have seen, one is looking at them as pointers to the unknown, and as parts of it.

It is in our striving to understand how these particulars hang together, both mutually and with the unknown, that we make sure that the unknown is really there, determined essentially by what is known about it (Polanyi, 1958, p. 128).

This is the sense in which we can say that the unknown is determined. It is determined in the sense that it is fully marked out by our conceptions. Furthermore, the reference to reality (the unknown that is really there), as the external pole of knowing, "...legitimates my acts of unspecifiable knowing, even
while it duly keeps the exercise of such acts within the bounds of a rational objectivity" (Polanyi, 1969, p. 133).

This conceptually determined knowledge is what Polanyi means by the term *foreknowledge*. It is the type of knowledge we hold in our general conceptions about the nature of things (Polanyi, 1969, p. 130), and discovery is a process that verifies this "knowledge":

Indeed, to an important degree all discovery is deductive. For no inquiry can succeed unless it starts from a true, or at least partly true, conception of the nature of things. Such foreknowledge is indispensable, and all discovery is but a step towards the verification of such foreknowledge.

(Polanyi, 1969, p. 130)

It is true that when discoveries are made, new explicit knowledge is revealed that has been guided by this foreknowledge, but, Polanyi says, each new discovery in turn yields a new conceptual vision as a result of conceptual changes that are induced by the discovery (1958, p. 135). This new conceptual vision is called foreknowledge.

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. (Polanyi, 1958, p. 135)

This vision, or foreknowledge, suggests to us the kinds of questions it should be reasonable and interesting to explore, and the kinds of conceptions and empirical relations that are plausible (Polanyi, 1958, p. 135).

All contact with reality is thus guided by conceptual vision, which implies the belief that what we are looking for is really there; furthermore, this belief enables us to be convinced that what we find or discover is true, or, in other words, that it also reveals what is objectively there.

Foreknowledge, or conceptual vision, is therefore a type of belief, in the sense that it is an as yet unverified guide to action. However, it lacks the "passionate" or "irrational" note that is usually implied by the term belief. It is thus belief in a conceptual sense, rather than an irrational sense, and it is the type of belief that is implied in Polanyi's notion of the fiduciary framework of knowledge.

The "passionate" component that spurs one on towards the verification of his foreknowledge or conceptual
beliefs is nonetheless present, but it is not a part of foreknowledge. The passionate component is housed in the intellectual passions, which will be dealt with in chapter 3.

The distinction between conceptual beliefs (which are part of foreknowledge), and passionate beliefs (which are housed in the intellectual passions), helps us see more clearly what Polanyi means by "personal participation", and how both conceptual and passionate components shape knowledge, while at the same time continue to fulfill the standards for Polanyi's conception of objective.

Foreknowledge is part of a conceptual framework, and hence, part of the structure of discovery. Consequently, discovery that is mediated by the conceptual belief of foreknowledge can sit within a logical from-to structure of knowing. Nevertheless, it is because of the nature of foreknowledge that it can also be said that the learner (or discoverer) must believe before he can know (Polanyi, 1958, pp. 208 & 130). In other words, solutions emerge in response to our search for something we believe to be there. This constitutes what Polanyi calls the fiduciary basis of knowledge. Discovery will always come to us with the conviction that it is true: it has been accredited in advance. Even the most daring feats of originality, Polanyi says, are subject to this law:
They must be performed on the assumption that they originate nothing, but merely reveal what is there. (Polanyi, 1958, pp. 129-130)

Kroger illustrates how Polanyi's notion of the foundation of scientific discovery is similar to Lonergan's account of the foundation of the scientific method. Lonergan identifies two modes of intentionality: "categorical" and "transcendental". He claims that, whereas categories are needed to generate determinate questions and give determinate answers, transcendental are contained in the questions prior to the answers, and that it is in this way that we are moved from ignorance to knowledge. This account of the foundation of the scientific method, Kroger claims, is very similar to Polanyi's tacit operations, or unformalized powers of mind (Kroger, 1977, p. 11). (It seems to me that Lonergan's concept of "transcendental" is also very similar to Polanyi's concept of "foreknowledge".)

To summarize the concept of foreknowledge and to join the concept to the focus of this section—namely, the functioning of the tacit in formal knowledge—the following can be said. Foreknowledge is a component of a conceptual framework that actually enables the tacit to function. This is because foreknowledge, although rooted in a
conceptual framework, is not formally bound by that framework. Thus, discovery can occur with its characteristic display of creative genius, and yet, in retrospect, discovery can always be seen to rest on what has historically come before.

The orientation of formal knowledge is not only directed by discovery and its consequent creation of a "new" conceptual vision; formal knowledge is also directed by the application of the vision of an existing conceptual framework. In the process of the application of knowledge to experience, the existing conceptual framework is modified and adjusted; always, however, in a direction that is generated by a desire for clarity and coherence, and guided by the tacit power that recognizes this coherence through the process of tacit knowing.

The next two sections will discuss the application and the modification of conceptual frameworks.

**Conceptual Frameworks: The Process of Application.**

There are two logical levels in any viewing of an external object: that of the observer, and that of the observed (Polanyi, 1959, p. 94). In order to observe something that is external to oneself, one must (logically) use a perceptual instrument.
In the case of a concrete external object (we will see that not all that is external to the observer is concrete), the perceptual instrument we use is the eye, and/or any instrument that helps the eye see more clearly—for example, a telescope or eye-glasses.

Polanyi's definition of reality has already been discussed in chapter 1: reality is external, hidden, but accessible to man. Another characteristic of Polanyi's conception of reality will be added here: although reality is external, it is not concrete.

Our heuristic cravings imply, like our bodily appetites, the existence of something which has the properties required to satisfy us, and that the intimations which guide our striving express this belief. But the satisfier of our craving has in this case no bodily existence; it is not a hidden object, but an idea never yet conceived... (Polanyi, 1958, p. 129)

There are thus two types of external "objects": concrete and non-concrete ones. Because a non-concrete one is just as separate or external to the observer as is a concrete object, the observer must, logically, use a perceptual instrument in order to observe it. It should be noted here that in referring to reality, to "observe"
means to "discover", to "know", or to "understand". The term observe is still being used only to show that there remains two levels in any act of observation, even the observation of a non-concrete object. The distinction is being made to show how this two-level structure is dissolved in an act of knowing, whether or not the observation involves a concrete object, in order to better show what Polanyi means by the terms involved in acts of knowing (subsidiary awareness, indwelling, and the function of the particulars).

The two-level distinction between observer and observed is further necessary by virtue of the fact that Polanyi's thrust extends most impressively into the rational domain where, although we are dealing mainly in the world of ideas and conceptions, we are nevertheless dealing with them in relation to the rationality of an external reality: "...the capacity of our minds to make contact with reality..." (Polanyi, 1958, p. 130 & 1959, p. 27). The merging of these two levels of rationality (internal and external) is what personal knowledge is all about. It is knowledge that remains tied to man for its explicit and tacit manifestations, yet remains tied to objective reality for its truth and validity.
In Polanyi's words,

The sense of a pre-existent task makes the shaping of knowledge a responsible act, free from subjective predilections. And it endows, by the same token, the results of such acts with a claim to universal validity. (Polanyi, 1959, p. 36)

We have seen that a perceptual instrument is necessary in order to observe an external object, whether or not it is concrete, by virtue of the fact that it is external. In the case of a concrete object, the perceptual instrument is the eye, binoculars, etc. The way we use perceptual instruments such as eyes or binoculars in the identification of external, concrete objects is analogous to the way we use concepts in the identification of non-concrete external objects (like an idea not yet grasped). In other words, concepts are our perceptual instruments when we are observing non-concrete, external reality.

The power of our conceptions lies in identifying new instances of certain things that we know. This function of our conceptual framework is akin to that of our perceptual framework, which enables us to see ever new objects as such ...

(Polanyi, 1958, p. 103)

Perceptual, as well as conceptual frameworks, thus
limit (or de-limit) the range of what we are able to see. We will see only as clearly as our perceptual and/or conceptual frameworks allow us to see, although either can be improved upon or expanded. For example, the telescope allows the eye to see many more wonders in the night sky than the eye would be able to see unaided. In the same way, as conceptual frameworks expand, one is able to see and interpret experiences much more clearly, or coherently.

Borrowing terms from Piaget, Polanyi identifies two associated movements by which we simultaneously apply and re-shape our conceptions: (1) by the process of assimilation, where new instances are subsumed under a previously accepted conception, and (2) by the process of adaptation, whereby conceptions are newly formed or modified for the purpose of dealing with new experiences (Polanyi, 1958, p. 105). All conceptions, Polanyi says, are ever ready to identify novel instances of experience by modifying themselves so as to comprise them (1958, p. 128).

From the preceding, it can be seen that a perceptual instrument, while limiting the range of what we can see, actually enables us to see. By a "perceptual" instrument was meant either a visual framework for a concrete object, or a conceptual framework, including the conceptual vision
implied in foreknowledge, in the case of a "non-concrete" object.

However, although one is enabled to see by means of a perceptual instrument, it does not automatically follow that one will see (or know or understand). First of all, according to Polanyi, and as mentioned earlier in the discussion of foreknowledge, one must be motivated to see. We are "...moved by a passionate craving to understand" (Polanyi, 1959, p. 98). Much of Polanyi's work talks about the passions, cravings and strivings, whether appetitive or intellectual, that propel and compel all animals and people towards an intellectual control, or, in other words, towards an understanding of its surroundings. As we will see in chapter 3, this understanding may manifest itself inarticulately, as for example, the way an animal knows its way about a maze, or the way an engineer grasps how parts of a machine function jointly. Human understanding may also, on the other hand, manifest itself articulately, as an operation that transforms a given set of formulae into another set (Polanyi, 1958, p. 184). Whether understanding is manifested inarticulately or articulately, it can be said that understanding is what one experiences comprehendingly. One experiences comprehendingly by means of (a) a perceptual
instrument (visual and/or conceptual framework),
(b) a desire that propels him to understand, or to make
sense of his surroundings, and (c) the "from-to" formula
that is contained within Polanyi's definition of knowing:

I regard knowing as an active comprehension of
the things known, an action that requires skill.
Skilful knowing and doing is performed by
subordinating a set of particulars, as clues
or tools, to the shaping of a skilful achievement,
whether practical or theoretical. (Polanyi,
1958, p. vii)

The preceding section described how and why a conceptual
framework is applied to experience. The intention was to
show how a conceptual framework is like a perceptual
instrument, such as the eye. This departs from the usual
analogy that a conceptual framework is like a mental map.
This departure is deliberate, for the following reasons.

The map analogy is adequate in terms of function:
a conceptual framework, like a map, serves as a guide
towards a specific purpose. However, the map analogy does
not reveal the dynamic nature of a conceptual framework.

Like an eye, a conceptual framework is capable of
adjustment and modification (the two-movement process
described earlier), just as a map may be adjusted or modified. But, unlike a map, the process is going on continuously.

Also, like the eye, a conceptual framework "de-limits" or sets apart a particular unit or field from within one's total field of vision (also like a map); however, it is a self-generated act in the case of the eye and conceptual framework (propelled by the desire or craving for clarity that is housed in the intellectual passions).

Nevertheless, a conceptual framework is, functionally speaking, an internal guide to interpreting experience. On the other hand, an "articulate" framework, such as a map, is an external guide. Polanyi says that an articulate framework is an instrument contrived by our inarticulate selves for the purpose of relying on it as our external guide (1958, p. 131).

There is, however, a relationship between a conceptual, internal guide, and an articulate, external guide.

We have seen that we must use a framework by an act of indwelling, a process by which we assimilate the standards and indications of the framework by using them. A conceptual framework (comprising a perceptual framework) assimilates an articulate framework, fusing it with the perceptual framework. Thus an articulate framework (an external guide) can become an internal guide to the extent
that it is assimilated to one's conceptual framework.
(In other words, an articulate system is to a conceptual
framework what binoculars or a telescope are to the eye).

As previously stated, the effort of integration
that achieves knowing relies on stimuli coming from
outside, from all parts of our body, from tools or
instruments assimilated to our bodies, as well as from
a wide range of linguistic pointers which bring to bear
our pre-conceptions, based on past experiences, on the
interpretation of our subject matter:

The structure of knowing, revealed by the limits
of specifiability, thus fuses our subsidiary
awareness of the particulars belonging to our
subject matter with the cultural background of

It has been shown that the application of a conceptual
framework to the interpretation of experience is a dynamic
process that involves the constant modification and
adjustment of the conceptual framework in the process.
Polanyi identifies a similar process in the way we
(a) interpret and re-interpret sensory clues, and also
compares this process to (b) the way we shape the
meaning of words. The passages that follow show how
both (a) perceptual, as well as (b) articulate frameworks
contribute to the overall modification of one's conceptual framework.

(a) how we interpret and re-interpret sensory clues:

Perception is manifestly an activity which seeks to satisfy standards which it sets to itself. The muscles of the eye adjust the thickness of its lens, so as to produce the sharpest possible retinal image of the object on which the viewer's attention is directed, and the eye presents to him as correct the picture of the object seen in this way. This effort anticipates the manner in which we strive for understanding and satisfy our desire for it, by seeking to frame conceptions of the greatest possible clarity. (Polanyi, 1958, pp. 96-97)

There is an

...urge to satisfy the more pressing requirement of seeing the object behave in a reasonable way ... (which allows the eye to go on seeing a tennis ball as a tennis ball, and not as a football as it approaches us) ...even though in shaping this perception the eye must override standards of correctness which it would otherwise accept as binding .... The rule that we follow
in shaping the sight of the inflated ball is one we taught ourselves as babies.... We had to choose between seeing the rattle (approaching our eyes) swelling up and shrinking alternately, or seeing it change its distance while retaining its size, and we adopted the latter assumption. By this way of seeing things we eventually constructed a universal interpretive framework that assumes the ubiquitous existence of objects, retaining their sizes and shapes when seen at different distances and from different angles, and their colour and brightness when seen under varying illuminations. This tremendous generalization, on which we base our understanding of the universe, we have in common with the higher animals. Their native sensory equipment and ours both set us similar standards of correct seeing, and it is this primordial standard which induces us to flout, in the case of the inflated ball, the contrary evidence of our retinal images. Indeed, it induces us to intervene actively in producing false evidence of the ball's approach to our eyes, by a misplaced effort of visual accommodation, undeterred by the fact that this destroys the sharpness and the binocular
correspondence of our retinal images. The process illustrates clearly the active principle which seeks to establish a coherence between all the clues of visual perception, so that our subsidiary awareness of them in terms of what we see shall satisfy us of having truly comprehended the things seen. (Polanyi, 1958, pp. 96-97)

Polanyi compares the process of interpreting and re-interpreting sensory clues to the process of how we shape the meaning of words:

In a larger perspective, the present experience of seeing the inflated ball come nearer to our eyes appears merely as the last of a life-long chain of experiences encountered and shaped by us, to each of which we reacted to make sense of it as best we could, and which are now all subsidiarily effective in the shaping and comprehension of our present experience. The sensory clues offered by the inflated ball thus appear to be evaluated together with an immense array of past clues, gone beyond recall -- but not without effective trace. This process, by which the meaning of sensory clues is established
in terms of our perceptions, is closely analogous to that by which we shape the meaning of denotative words in the lifelong course of applying them to a long series of identifiable instances. These linguistic identifications are in fact based primarily on the sensory identification of objects at varying distances, under varying angles and varying illumination, and merely extend the theory of the universe implied in our sensory interpretations to the wider theory, implied in the vocabulary by which we talk about things. (Polanyi, 1958, pp. 96-97)

Polanyi further defines the process by which we shape the meaning of words:

The reiteration of linguistic utterances with reference to identifiable occasions carries with it a change of their meaning, each time we either listen to speech or utter it ourselves. (Polanyi, 1958, p. 105)

The re-interpretation of language can take place at a number of different levels: receptively, as when a child is learning to speak; innovatively, as when poets, scientists, or scholars propose linguistic innovations;
or at an intermediate level, in the everyday use of language which modifies it imperceptively, without any conscious effort at innovation. (Polanyi, 1958, p. 105)

Summary of Conceptual Frameworks. The preceding sections on the application and modification of a conceptual framework were intended to show the dynamic nature of such a framework, in order to show how it is more like a perceptual instrument (such as an eye), than it is like a mental map. The map analogy was found lacking in that it describes the function, but not the nature of a conceptual framework.

A focus on the nature of a conceptual framework is considered essential in order to see how the shaping of knowledge is really the shaping of a conception (Polanyi, 1958, p. 104). To understand the nature of a conceptual framework is to understand how knowledge can be both (1) personal (we utilize a framework that we have shaped by submitting to its standards and indications, compelled as we are by a desire to make sense of our experiences), and can be (2) objective at the same time (the foreknowledge that is contained within one's conceptual vision guides one to a revelation of what one believes is already there, as well as to what one already believes is there—knowledge which is accredited in advance by the belief).
The connection between personal and objective (the internal and external poles of the continuum) implied in Polanyi's conception of personal knowledge does not imply that personal knowledge is protected from error, falsehood, and mistaken assumptions. It does imply, however, that personal knowledge is, ultimately, the only road to truth.

**Tacit Knowledge and Personal Knowledge.** This chapter focused on the dynamic nature of conceptual frameworks, showing how they function as perceptual instruments in the observation of that which is external, yet non-concrete. (It was seen that the conceptual joins with the perceptual framework and functions as a single perceptual instrument in the observation of external, concrete objects.)

It was also shown that the structure of knowing, achieved through the process of indwelling, effectively transcends the limits imposed in any act of observation, by dissolving the boundaries between the logical levels of observer and observed. It is therefore possible for us to say that knowledge can be personal (it is shaped by the knower), while at the same time, it retains Polanyi's essential "objective" characteristic of knowledge (it is capable of revealing aspects of what is essentially and fundamentally indeterminate—see chapter 1).
The title of this chapter, "Man's Vision of Reality: Knowing and Knowledge", was chosen in order to clarify and highlight the notion of "determined", yet "indeterminate"--the dual referents that exist at opposite ends of the single continuum in Polanyi's conception of knowledge. The term Polanyi himself uses to suggest this continuum is: personal knowledge.

We are now at a point where we may attempt a definition and thus, a distinction, between the subtly interwoven concepts of tacit and personal knowledge.

Tacit knowledge is unformulated knowledge. We will thus not find it in books or manuscripts. The bank of tacit knowledge will be found in the individual (human being or animal), and will be manifested as specific instances of the individual's knowing (intellectual feats) and/or doing (muscular feats). Tacit knowledge is increased through understanding and experience, and the corresponding increases will be manifested as intellectual feats requiring varying degrees of connoisseurship (knowing) and/or muscular feats requiring varying degrees of skill (doing).

Although tacit knowledge is, by definition, unformulated knowledge, the content of tacit knowledge banks may change—that is, some tacit knowledge may, on analysis, become formulated knowledge, whereas new tacit knowledge may be
gained through new understandings and/or experiences. This implies, of course, that my bank of tacit knowledge is different from yours. Very often, however, tacit knowledge banks may coincide—as, for example, in knowing how to swim. When we talk about tacit knowledge then, we are talking about things we know or know how to do, without being able to say exactly how we know or even all that we know.

Tacit knowledge is also to be distinguished from the act of knowing. Knowing is always a tacit, unformulated act, whereas not all knowledge is tacit. Some knowledge is explicit, formal knowledge—the kind we find in books, maps, formulae, etc. Although this type of knowledge is formal and explicit, to "know" what is in books is an unformulated, tacit act, whereby the "clues" or particulars that are given explicitly are integrated tacitly in order to arrive at an understanding, which is a tacit feat of intelligence. "Knowing" to Polanyi thus means understanding, discovering, grasping meaning, inventing, recognizing, performing. These are all forms of knowing, for all have the same essential structure composed of knower, subsidiary clues, and focal awareness.

In order to understand just how essential the structure of tacit knowing is to "making sense" of experience, it
is important to remember that the position of meaning does not coincide with the position of clues (Polanyi, 1969, p. 161), but at a point outside its clues. This leaves meaning open and changeable, as new meanings can be integrated in response to new clues. Tacit knowing is important because it represents the individual's ability (based on tacit faculties which will be discussed in chapter 3) to be aware of, and to respond spontaneously to the ever changing conditions of his environment (mental or physical) and, through experience, to adapt to this environment through increased intellectual control over it. Because of tacit knowing, we can "learn through experience". It (the power of perceiving coherence) is "acquired by early training in the infant child (and is) continuously developed by practice" (Polanyi, 1969, pp. 127, 139).

Personal knowledge has an added dimension. It has an external, objective referent (reality). The knower participates in the shaping of knowledge of this external referent through his commitment to standards of truth, manifested through the appraisal and evaluation of his knowledge in terms of these standards (see chapter 1). Because the knower's commitment to universal standards transcends the subjective referent (the internal and
opposite pole of the continuum), his knowledge is not subjective. Yet, because he has personally participated in the shaping of it, his knowledge is personal.

My reference to reality legitimates my acts of unspecifiable knowing, even while it duly keeps the exercise of such acts within the bounds of a rational objectivity. (Polanyi, 1969, p. 133)

One may well question why Polanyi did not call such knowledge "objective", instead of "personal". It is because, even though subjectivity has been transcended through commitment to standards of truth, knowledge may still be mistaken or false. We see this happening all the time in science, as theories are discarded, revised and modified. True objectivity contains the notion of objective truth, not only the application of standards of truth, as in theory. Thus, completely objective knowledge, because it consists of the application of standards of truth, is a false ideal, whereas "personal" knowledge more accurately describes the process, goals, and results of knowledge-building. Furthermore, reality is fundamentally indeterminate, as we have seen in chapter 1, and so all of the implications of its truth cannot ever be spelled out, or made determinate, in the
form of explicit knowledge.

Although all knowledge is fundamentally tacit (because all knowing is tacit), and although all explicit knowledge has a tacit component (it has been tacitly, directionally shaped by the knower), personal knowledge is basically unformulated (tacit knowledge). Personal knowledge is knowledge of reality that one sees but does not yet understand (Polanyi, 1969, p. 64).

The bank of personal knowledge is thus found in the individual, but, as aspects of this knowledge are formulated, the bank of personal knowledge may also include intellectual feats that are characterized by their reference to an objective pole, external to the knower. Thus, although personal knowledge speaks from an individual at a particular place and time (as tacit knowledge does), personal knowledge is also capable of speaking to all of us about something that is outside all of us all the time: reality, or objective truth. The added characteristic of an external pole (of reality) is what distinguishes "personal" from "tacit". "Personal" is thus "tacit", but it is more. And although tacit knowledge can be held by man or animal, personal knowledge can only be held by man.

Although tacit is the "opposite" of formal or explicit, personal is not really the "opposite" of either.
R.J. Brownhill identifies two types of knowledge: (1) personal, which he says is the tacit origin of interpersonal; and (2) interpersonal, or traditional knowledge that is shared and accepted by the concerned public. Brownhill says that the evolution of truth is expressed through individual initiative (personal knowledge), but controlled by tradition (interpersonal knowledge). (Brownhill, 1977, pp. 153-163)

I feel that Brownhill's pairing of "personal-interpersonal", rather than "tacit-interpersonal" reflects the subtle distinction between Polanyi's concepts of "personal" and "tacit" that has been discussed in this section.

I would like to make one further point to clarify this distinction. Although both tacit and personal knowledge are aspects of our being, the implication is that personal knowledge alone can transcend our being, thereby modifying our "selves" in the process. This is what occurs in a mystical or contemplative experience and, in lesser degrees, this is what happens all along the road of personal knowledge, as the knower applies standards or ideals with universal intent. His subjective being is transcended, and his self is modified in the process.
Chapter 3: The Scope of Polanyi's Thought: Powers & Passions

Introduction. This chapter will focus on tacit powers and intellectual passions, which are two component features of intellectual activity.

The main points that will be discussed concerning powers and passions are the following: (a) The tacit faculties, or potentialities, that underlie tacit powers are similar in people and animals, yet the manifestation of those powers are different. Animals (and children before the acquisition of language) can only manifest tacit powers at the prearticulate level of intellectual activity, whereas people manifest tacit powers at both inarticulate and articulate levels of intellectual activity. (b) The range of man's tacit powers is able to extend into the articulate domain because of language. Man uses language subsidiarily, and in so doing, is able to cast the tacit powers into the articulate domain of intellectual life. These tacit powers are manifested in the articulate domain as characteristic relations between thought and speech, and between language (speech) and conceptual frameworks (thought). (c) Intellectual passions are as much a part of intellectual life as are tacit powers. Without the urgings and strivings of the passions that compel the organism to gain and maintain intellectual control over experience, the tacit powers
would remain unexercised and in their dormant state as innate faculties or potentialities. There is thus a relationship between passions and powers.

The sources from which the educational implications will be drawn regarding the above points will be indicated within the text of the chapter at the appropriate places.

Powers and Passions: The Roots. Chapter 2 described how the tacit functions. It was seen that the tacit functions in two ways: in the act of knowing, which is an entirely tacit act, and in the shaping of formal knowledge. There is a parallel between these two ways of tacit functioning: just as the act of knowing is the integration of a set of particulars through the process of indwelling, so too a conceptual framework is the integration of sets of particulars through the process of indwelling. It was seen that the vision or foreknowledge that is generated by dwelling in a conceptual framework constitutes the direction or orientation of the vision and hence, the direction or orientation of knowledge. Thus, the shaping of knowledge is really the shaping of a conception, and it is in the process of applying a conceptual framework to experience that the framework is modified and shaped. Because the individual dwells within this framework, it can be said that he actively participates in the shaping of knowledge; he does
so through the vision or foreknowledge that is generated by indwelling.

Foreknowledge is thus an "informal" feature of the process of indwelling and, as such, it is a feature through which the tacit is able to function—and through its functioning, to shape knowledge. This is how the tacit functions. But what, exactly, is the tacit?

The word tacit has been used to describe both knowledge (tacit and personal) and a process (knowing and the shaping of knowledge). From these uses, we can understand tacit to mean two things: (a) "unformalized" knowledge, and (b) a "heuristic" process. However, although these two meanings describe how the tacit functions, they do not describe the nature of the tacit.

Tacit actually refers to a mental or intellectual power that people and animals possess. It is the power to perceive coherent patterns, or "gestalten". According to Polanyi, it is the ultimate faculty for acquiring and holding knowledge (1959, p. 25).

The human tacit power to perceive coherences is rooted in two distinct tacit powers that function in animals: the tacit powers of observing and contriving. These two powers can also function together in higher animals, resulting in a primordial form of the power of understanding.
The separate powers of observing and contriving are, in turn, rooted in two underlying faculties: (1) the power of observing is rooted in a tacit perceptive faculty; (2) the power of contriving is rooted in a tacit motoric faculty. The power of understanding is rooted in a combination of the two faculties. (Polanyi, 1958, pp. 71-76)

The development of any innate faculty is usually based on the exercise of that faculty in the satisfaction of an urge or a desire. For example, leg muscles are developed in walking because we want to get around. So too for the tacit faculty. The urge that underlies the development of the tacit faculties into their corresponding powers is rooted in the active principle. The active principle states that the organism is innately sentient and alert, and that this innate sentience and alertness is manifested as exploratory movements, appetitive drives, and powers of perception that urge the organism to look for clues and make sense of them. (Polanyi, 1958, p. 96)

The organism, however, is able to make sense of clues through the exercise of its innate tacit faculties of perception and mobility described above. It can thus be seen that powers and passions are closely connected.

In summary of the preceding, (a) the primordial roots of the tacit powers of observing and contriving (and
understanding which combines the two) are the innate perceptive and motoric faculties; and (b) the primordial roots of the intellectual passions (urges, drives, and powers of perception) lie in the active principle. Furthermore, the innate tacit faculties are exercised in response to the urgings or strivings of the passions that seek to be satisfied. The capacity to perceive coherent patterns is a tacit power of organisms, and constitutes the type of intellectual control over experience that enables the organism to satisfy its urges.

One of the important points concerning the above is that there is clearly a relationship between the organism's strivings to understand or control experience, and the tacit powers that enable it to do so: "Intellectual passions perpetuate themselves by their fulfilment" (Polanyi, 1958, p. 173). The nature of this relationship concerns (and can even be seen to parallel) the "educational" relationship between the learner and the curriculum as a source of intellectual satisfaction to the learner. The educational implications of this relationship especially concern the role of the teacher, and will be discussed in chapter 7.

As intellectual passions or urgings become increasingly complex, their satisfaction demands the exercise of tacit powers over increasingly expanded ranges of intellectual
life. It is in this manner that the range of tacit powers is extended from the prearticulate domain of intelligent behaviour in animals (where the tacit power is manifested as different types of animal learning), into the articulate domain of intelligent behaviour in human beings (where the tacit power is manifested as different types of understandings or formal systems of thought). The complementary roots and the continuity of the relationship between intellectual passions and tacit powers thus remains throughout the prearticulate and articulate domains of intellectual life. Powers sustain, fulfill, and thus renew passions; and passions exercise and thus expand the range of powers.

The following sections of this chapter will now "ignore" the relationship between powers and passions that this section has just sought to establish: the next sections will focus on powers and passions separately. The reader is thus invited to keep the "passions-powers" relationship in mind in a subsidiary manner.

**Tacit Powers: Manifestation at the Prearticulate Level of Intellectual Life.** The preceding section stated that tacit powers are exercised over increasingly expanded ranges of intellectual life, as intellectual strivings or passions become more complex. Before proceeding to the
more complex, articulate level of manifestation, this section will describe how tacit powers are manifested at the prearticulate level of intellectual life.

We have seen that although there are two kinds of human knowledge, tacit and explicit, the nature of all knowledge (even explicit) is tacit. Thus, we cannot really say that the two types of knowledge are fundamentally different. Although the power of thought is enhanced by the use of symbols (explicit knowledge), it nevertheless operates within the medium of tacit, unformalized intelligence that man shares with the animals (Polanyi, 1958, p. 82).

Polanyi's definition of learning is any behaviour that is not specifically included in the animal's native repertoire (1958, p. 71). (The functioning of internal organs and instinctive performances are regarded by Polanyi as classes of sub-intelligent behaviour.) Furthermore, Polanyi regards learning as an act of intelligence (1958, p. 71).

Polanyi identifies three types of animal learning, or manifestation of the tacit power at the prearticulate level of intelligence in animals: Type A, or trick learning; Type B, or sign learning; and Type C, or latent learning. These three types of animal learning are the behavioural manifestations of the three tacit powers described earlier;
contriving, observing, and understanding (Polanyi, 1958, pp. 76, 184).

The tacit mental faculties are constant at both prearticulate and articulate levels of intelligence: "All human knowledge is now seen to be shaped and sustained by the inarticulate mental faculties which we share with the animals" (Polanyi, 1959, p. 26); it is the use of language that expands the range of those powers.

**From Inarticulate to Articulate: A Tacit Continuum.**

Human, explicit knowledge is rooted in tacit, unformalized knowledge—the same kind of knowledge that animals manifest, and these tacit roots are sustained throughout man's striving for intellectual control of his experiences. In other words, there is a continuum between tacit and explicit, and consequently, between the tacit, inarticulate knowledge of man and animals, and the explicit, articulated knowledge of man. Yet we know that human knowledge is far superior to animal knowledge, and Polanyi's philosophy tells us why and how.

People do not possess any "special" tacit powers that account for man's superior knowledge. Human knowledge surpasses animal knowledge because of the expanded range over which tacit powers are able to function. The expanded
range of tacit functioning is due to two basically interdependent factors: (1) man has a slight, almost imperceptible advantage in his inarticulate faculties (the same inarticulate faculties that animals possess), and this slight advantage is responsible for the rise of man's (2) language ability (Polanyi, 1958, pp. 69-70). It is because of language that man is able to extend the range and thus the power of his tacit faculties.

Thus, insofar as human knowledge is superior to animal knowledge, it is so because of language, and what is particular and special about human knowledge can be said to proceed from the term articulation. This term was introduced at the end of chapter 2 in the passage concerning the interpretation and re-interpretation of language. Consequently, although this chapter has so far discussed the roots of tacit powers and their prearticulate manifestation in animals, a major section must now be devoted to the manifestation of these powers in articulate, human knowledge.

Although Polanyi identifies two forms of knowledge, the tacit and the explicit (1959, p. 17), this distinction is largely meant to convey the contrast between the unarticulated and unformulated nature of tacit knowledge and the articulated, formulated nature of explicit
knowledge. Although by definition tacit knowledge is unformulated and unarticulated, we have seen that, in reality, tacit knowledge may become explicit, depending on the nature of the limits of the specifiability of its particulars (see chapter 2). If this were not so, then there would be a division between the two types of knowledge (tacit and explicit), rather than a continuum. (The concept of a continuum versus a division has important educational implications regarding forms of knowledge, and will be discussed in chapter 8).

Furthermore, if there were a division between tacit and explicit knowledge, rather than a continuum, then explicit knowledge would be like a ship without a rudder, for it would have no tacit faculties that would serve to orient and guide it. The ship might maintain a course, but would have no basis on which to stake a claim to the legitimacy or rightness of its direction. In other words, there would be no basis for the type of evaluation and judgment that is implied in Polanyi's conception of "personal" knowledge.

Since tacit powers function tacitly and not explicitly, they are able to affect and effect explicit knowledge only insofar as they are components of it. Explicit knowledge then, has emerged out of tacit knowledge and has developed
and progressed (and continues to do so) into articulated, formal systems of thought in response to the gentle (and sometimes dynamically creative) urgings of its tacit meanderings, whose aims and purposes are guided by a belief in, and a commitment to, objective truth.

One might be inclined to assume that in the end, explicit knowledge must surely always arrive at a knowledge of objective truth. Not so. The belief that the essential quality of knowledge is objective, rather than tacit, leads to this assumption. Polanyi's conception of the relation between objectivity, truth, and knowledge was discussed in chapter 1. In one brief sentence, the following is a summary of his conception: although truth is objective, knowledge is shaped by man and is therefore personal—and personal knowledge may or may not lead to a knowledge of objective truth. The following analogy may help to clarify this important feature of Polanyi's thought.

Let us compare the relation between knowledge and objective truth to the fable of the race between the hare and the turtle. Let us say that the finish line is objective truth, the hare is explicit knowledge, and the turtle is tacit knowledge. Although the turtle (tacit knowledge) is the meanderer, it gets to the finish line first, for although it is slow, it is constant and
deliberate. The hare (explicit knowledge) may make many stops along the way--may even at times dart off in the wrong direction and end up somewhere else. But no matter; that's in the nature of the hare. The pair, however, is a team: each dependent on the other to reveal what, for our purposes, is the moral of this story. And the moral is that, although the turtle (not the hare) was destined from the beginning to win the race, there wouldn't have been a race if there hadn't been a hare, for the simple reason that a turtle can't race (it's not in its nature). This, in a nutshell, is what Polanyi means when he says that "our whole articulate equipment turns out to be merely a tool-box, a supremely effective instrument for deploying our inarticulate faculties" (1959, p. 25).

Although the tacit dimension is the predominant characteristic of all knowledge and is man's ultimate faculty for acquiring knowledge (for winning the race), we need articulated systems as instruments for enlarging the range of the tacit powers that originated these systems in the first place (in order to have a race). For if man's knowledge is superior to animals', it is not because man can invent and use symbols such as words: "Neither words nor symbols nor maps can be said to communicate an
understanding in themselves" (Polanyi, 1959, p. 21). Man's knowledge is superior to animals' knowledge because, in using and inventing these symbols, man is simultaneously expanding the range, and thus the power of his tacit faculties that he has in common with the animals. For, according to Polanyi, understanding is a tacit feat of intelligence, an informal operation of the mind that suggests broad expansions of powers of comprehension (1959, p. 23). In order to understand what it is that symbols communicate, man must expand the power of his tacit faculties, and his subsidiary use of language does this.

Thus, whether or not knowledge actually leads to a knowledge of objective truth will depend a lot on our willingness to accredit the tacit dimension of our knowledge (the acceptance of the fact that it's the turtle-hare pair that's essential to the story). By accrediting the tacit dimension, we can then proceed to search for and expose the fundamental assumptions that underlie our beliefs (a tacit, orienting feature), in order to justify those beliefs on rational grounds.

We have seen in chapter 1 that one of Polanyi's fundamental assumptions concerning the nature of reality is that it is rationally-governed. Consequently, whether
or not objective truth will be found at the finish line will be determined, not by some external, objective criterion of truth, but by an internal, interpersonal criterion of rationality. This internal, interpersonal criterion of rationality seeks to satisfy man's intellectual strivings or passions; the nature of the standards of satisfaction will be discussed later in this chapter.

**Tacit Powers: Manifestation at the Articulate Level of Intellectual Life.** At the articulate level of intellectual life, each of the three tacit faculties (contriving, observing, and understanding) are developed, through the use of language, into a distinctive science to which, Polanyi says, the other two (faculties) contribute subsidiarily. Thus, "Trick-learning may be regarded as an act of invention; sign-learning as an act of observation; latent learning as an act of interpretation" (Polanyi, 1958, p. 76).

In other words, the three types of animal learning are the primordial forms of the manifestation of the three faculties that are more highly developed in man (the faculties of inventing, observing and interpreting in man, which correspond to the faculties of contriving, observing and understanding in animals). These three, more highly developed tacit faculties in man are manifested at their highest articulate level as the
following sciences: inventing is manifested as the subjects of engineering and technology; observing is manifested as the range of natural sciences; and interpreting is manifested as mathematics, classical mechanics, and the system of logic in disciplined thought—\textendash that is, as the deductive sciences (Polanyi, 1958, pp. 76, 184).

Furthermore, there are two kinds of intelligence in people: one achieving innovations, such as acts of invention and discovery; and one operating a fixed framework of knowledge, such as the classification of butterflies according to a classification system that is already established. The first type of act is \textit{heuristic} and \textit{irreversible}, whereas the second type of act is \textit{routine} and \textit{reversible}. "Intellectual acts of a heuristic kind make an addition to knowledge and are in this sense irreversible, while the ensuing routine performances operate within an existing framework of knowledge and are to this extent reversible" (Polanyi, 1958, p. 77).

These two kinds of intelligence are also prefigured at the prearticulate level of intelligence in animals.

The heuristic, irreversible act is manifested at the prearticulate level as the \textit{act of contriving} in trick-learning, as the \textit{act of observing} in sign-learning,
and as the act of understanding in latent learning. The actual process of learning is covered by this first, heuristic stage, whereas the second stage of learning consists in displaying the knowledge acquired in learning. The reversible, routine application of stage 1 learning at stage 2 is manifested as follows: in trick-learning, as repeating the trick; in sign-learning, as continued responding to the sign; and in latent learning, as solving a routine problem. (Polanyi, 1958, p. 76)

In every process of learning then, there are two stages: stage 1 is irreversible, the result of a heuristic act that occurs after systematic exploration that results in the gradual building up of an interpretive framework, or that occurs as the result of a puzzled contemplation leading to a flash of insight. Stage 2 is a performance stage, or the stage of displaying the knowledge gained in stage 1. (Polanyi, 1958, p. 75)

Polanyi's analysis of the roots of the process of learning thus provides a philosophical basis for "stage" or "cyclical" views of learning in the educational experience. Such methods are advocated by A.N. Whithead, S. Reese, and K.R. Conklin, and will be discussed in chapter 6.

Although the distinctive sciences represent the manifestation of the tacit powers at the articulate
level of intelligence, a description of the relation between thought and speech will help to show how this is so.

**Relation Between Thought and Speech.** A description of the relationship between thought and speech is actually an account of how the tacit operates in the articulate domain of intellectual life, and thus shows how the tacit faculty actually accounts for the progression of knowledge achieved by articulation.

According to Polanyi (1958, pp. 98-100), there are three characteristic relations between thought (a tacit process) and speech. A summary of these three relations follows, along with Polanyi's examples. As will be seen, the different relations between thought and speech also represent three domains, or areas of thought where the tacit and explicit (articulated knowledge) are related to each other, but in very different proportions.

The three relations are the following: (1) The tacit makes sense of scanty clues conveyed by speech in the **ineffable** domain, Polanyi's term for the domain where both knowledge and thought are tacit. In this domain, because the tacit predominates, articulation is virtually impossible. (Examples: any acquisition of a skill, either muscular or intellectual, such as how to ride a
bake, how to swim, or how to solve a type of math problem.)

(2) The tacit is co-existent with speech in forming
concepts (a focal awareness) conveyed by intelligible
text and remembering its message. Example: in reading
a letter, the message or meaning is not something tangible--
it is the conception evoked by the text. There is a
conscious subsidiary awareness of the text and a conscious
focal awareness of the meaning (or content or message)
of that text. Meaning (of the words in a letter) in this
case differs from meaning in the ineffable domain because
of its verbal origin. (3) The tacit and formal components
of thought fall apart in the domain of sophistication,
the centre of operations, Polanyi says, for re-adjusting
tacit and formal components of thought. This domain is
characterized by a state of mental uneasiness, due to a
feeling that one's tacit thoughts do not agree with
symbolic operations. In this domain, we must decide on
which we will rely--either the conception or the symbolic
operation--and, based on this decision, we must correct
or modify the other.

There are two instances where this "uneasiness" occurs
in the domain of sophistication: (a) due to an ineptitude
of speech, articulation may encumber tacit thought. In
this case, fumbling may occur. An example of articulation
encumbering tacit thought occurs when children are learning to speak; they find it easier to solve practical problems than to solve the corresponding verbal ones. (b) The other instance where uneasiness occurs in the domain of sophistication is when symbolic operations outrun our understanding, and therefore, anticipate new modes of thought. This is the result of the pioneering work of discoverers who were able to put thought into articulate terms and thereby cross logical gaps. For example, the speculative use of irrational or negative numbers into unexplored regions were gradually accepted as denoting new and important mathematical conceptions.

Polanyi's account of the relations between thought and speech, characterized by the different domains of thought (the ineffable, the area where the tacit is co-existent with speech, and the domain of sophistication) bears some resemblance to Northrup Frye's account of the three important ways that language can be used. Frye's descriptive way seems to parallel Polanyi's domain of sophistication; Frye's language of transcendence seems to parallel Polanyi's ineffable domain; and Frye's metaphorical language seems to parallel Polanyi's area where the tacit and formal are co-existent. The following is Frye's account of these three ways that language can
be used.

There are different ways in which language can be used, three of them of particular importance. One is the descriptive way that we find in science and everywhere else where the aim is to convey information about an objective world. Then there is the language of transcendency that we find in large areas of philosophy and religion, an abstract, analogical language that expresses what by definition is really beyond verbal expression. And there is the language of immanence, the metaphorical language that poetry speaks, where anything can be identified with anything else, where natural objects can become images of human emotions. (Frye, 1990, p. 159)

In the next section, the relation between thought and speech will be expanded to show the relation between a conceptual framework (thought) and language (speech). The actual functioning of this relationship was discussed in chapter 2—the process by which a conceptual framework is modified by the assimilation of an articulate framework was shown to occur through indwelling, and subsidiary awarenesses. Thus, although chapter 2 showed how a
a conceptual framework is modified by an articulate framework. The next sections will show why this occurs. It will be seen that the reason lies in the nature of the tacit faculties and their power to satisfy intellectual standards.

Relation Between a Conceptual Framework (Thought) and Language (Speech). The tacit faculties function in language, and language, in turn, enlarges the range and power of those faculties. Man's capacity for language gives him such tremendous intellectual advantages over animals, not only because articulation makes him better informed, but because articulation increases his mental power over any given piece of information:

The vast accumulation of explicit statements of fact in our modern culture fosters an equally extensive proliferation of our thought in control of facts. Subsidiary awareness is a dwelling of our mind within the subject of which we are subsidiarily aware, and an articulate framework is therefore accepted ultimately as a happy home for our understanding; it is the soil on which our understanding can live and grow, while satisfying ever further its craving for clarity and coherence. (Polanyi, 1959, p. 32)
According to Polanyi, human thought grows only within language:

Even while our thoughts are of things, and not of language, we are aware of language in all our thinking (so far as our thinking surpasses that of the animals) and can neither have these thoughts without language, nor understand language without understanding the things to which we attend in such thoughts. (1958, p. 101)

Thus, we come into existence mentally by the assimilation of an articulate system (by using language) in order to understand experience (Polanyi, 1959, p. 60). Our native gift of speech enables us to enter on a mental life. Although limitations on this mental life may be imposed by the mediums of social dependency and bodily existence (Polanyi, 1959, p. 86), in the end, the extent of our acceptance and reliance on the existing medium of society for shaping our thoughts is ultimately a tacit personal commitment that we are responsible for (Polanyi, 1959, p. 87). In other words, we can take it, but we can't leave it, for the particular circumstances of our birth, the "conditions of our calling", are the givens. We must proceed from there, if we are to proceed at all. As we have seen in chapter 2, we cannot proceed (expand our
tacit powers of understanding) without accepting and relying on a system of interpretation—without "dwelling" in it. There is thus a sense in which one must accept that he is dependent on his social and intellectual heritage for mental growth, and the implications of this dependence will be discussed in chapter 8 in the "role of the learner".

Language: The Root of Intellectual Dependence and The Condition of Intellectual Growth. Accepting and relying on an articulate cultural system as a condition to mental enlargement is initially taken for granted in one's upbringing, but later, as the individual's distinctive mental qualities continue to develop through education, this reliance requires an attitude of reverence in "apprenticing ourselves to the understanding and imitation of the great minds of the past" (Polanyi, 1959, p. 98).

To contemplate a person as an ideal is to submit to his authority. The admirer of Napoleon does not judge him by independent previously established standards, but accepts, on the contrary, the figure of Napoleon as a standard for judging himself. Such an admirer may be mistaken in the choice of his hero, but his relation to greatness is correct. We need reverence to
perceive greatness, even as we need a telescope to observe spiral nebulae. (Polanyi, 1959, p. 96)

Even though all knowledge begins with the acceptance (even passively) of an interpretive framework, and thus rests on understanding and is in this sense basically the same at all levels of existence, we need expanded tacit faculties as what we are trying to understand becomes more complex.

As the subject of our understanding ascends to higher levels of existence, it reveals ever new comprehensive features, the study of which requires ever new powers of understanding. (Polanyi, 1959, p. 73)

The range of tacit powers is increased as the interpretive framework expands, but because, as we have seen, human thought grows only within language, it follows that a conceptual, interpretive framework will be developed mostly by listening and speaking:

Every use of language to describe experience in a changing world applies language to a somewhat unprecedented instance of its subject matter, and thus somewhat modifies both the meaning of language and the structure of our conceptual framework. (Polanyi, 1958, p. 104)
Different languages sustain different conceptual frameworks which give rise to and sustain different cultures. 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 actions. If, and only if, we believe in witches may we burn people as witches; if and only if, we believe in God will we build churches; if we believe in master races we may exterminate Jews and Poles; if in class war, we may join the Communist Party; if in guilt, we may feel remorse and punish offenders.... (Polanyi, 1958, pp. 112-113)
Languages are the product of man's groping for words in the process of making new conceptual decisions. Different languages are alternative conclusions, arrived at by the secular gropings of different groups of people at different periods of history. They sustain alternative conceptual frameworks, interpreting all things that can be talked about in terms of somewhat different allegedly recurrent features. The confident use of the nouns, verbs, adjectives and adverbs,
invented and endowed with meaning by a particular sequence of groping generations, expresses their particular theory of the nature of things. In learning to speak, every child accepts a culture constructed on the premises of the traditional interpretation of the universe, rooted in the idiom of the group to which it was born, and every intellectual effort of the educated mind will be made within this frame of reference. Man's whole intellectual life would be thrown away should this interpretive framework be wholly false; he is rational only to the extent to which the conceptions to which he is committed are true. (Polanyi, 1958, p. 112)

When we are born into a culture, we are born into a particular idiom that has been created by the language of that culture, and that continues to be sustained by that language. But because language functions subsidiarily, within a conceptual framework that is tacitly guided by capacities for combining practical, observational, and interpretive endowments (our tacit faculties), language itself can be modified or "re-interpreted". We saw this relationship between language and conceptual frameworks at the end of chapter 2.
The tacit power of mind uses language subsidiarily, to clarify and bring into focus what it senses "rationally". There is lots of room for error in the adoption of an articulate system, as Polanyi states in the previous passage. This is because the formalization of thought functions according to its own operational principles, resulting in what Polanyi calls a **logical gap** between the articulated, formal, and tacit, informal components of thought. We fall prey to error because of the ever present schism, or logical gap, between the tacit and the articulate.

There are also logical gaps between different conceptions of experience, or different conceptual frameworks (Polanyi, 1958, p. 151). Each may be stable and coherent in terms of accounting for the evidence it accepts as well-established, and justifying, for the time being, facts or alleged facts which it cannot interpret (Polanyi, 1958, p. 151). A logical gap may be bridged by conceptual reforms introduced by further discovery.

With all this possibility for error, we nevertheless adopt articulate frameworks because they are intellectual tools of "boundless power" (Polanyi, 1958, p. 94). Our tacit powers that are potentially able to discover and affirm truth would be too impotent in their native form to contact or even recognize the rational in nature—the true mark
Polanyi claims, of objective truth (chapter 1).

Although we may sometimes be lead into error, individual minds are able to both (a) pioneer the bridging of logical gaps between tacit and articulate to "prepare" the way for tacit acts of individual understanding in future generations, and (b) to introduce conceptual reform as the need arises. We collectively depend on a few great minds to lead us to truth, and we trust that their clarity of vision and adherence to what Polanyi calls "universal standards" will not lead us on a mistaken path. But we have no other choice, for our tradition of knowledge is made up of the accomplishments and discoveries of these great minds; in order to embark on a mental life, we must enter into this articulate tradition, for it is our heritage, one that is sustained by our culture and our language—we have no other heritage. As said before, we can take it, but we can't leave it. This is because our native tacit faculties are ever present as an inarticulate guide directing our mental life. We may not choose whether or not we want to go, but only, insofar as we accept our intellectual heritage, how far we will go in terms of mental growth. Because of the active principle, intellectual strivings are ever present, and tacit powers will ever direct one on towards the satisfaction of those strivings.
We are "free" to the extent that we choose, and can choose, the criteria, or standards, of our satisfaction.

**Intellectual Passions.** We have seen how the tacit powers are manifested at both the prearticulate level of intellectual life in animals (as the three types of animal learning), and at the articulate level of intellectual life in man (as distinct sciences).

We have also seen how the tacit faculties are deployed by the passions— that is, tacit faculties are exercised towards the satisfaction of the urgings and strivings of the intellectual passions. In this sense, there is a relationship between powers and passions.

Just as tacit powers are manifested in different ways at the prearticulate and articulate levels of intellectual life, so too for the passions.

At the prearticulate level, intellectual passions are manifested as exploratory movements or appetitive drives, whereas at the articulate level, intellectual passions are manifested as cravings for clarity and coherence according to standards or criteria that are universal. (It may seem strange to refer to exploratory movements and appetitive drives as "intellectual" passions; they are intellectual in the sense that they are "mental" urges to "make sense" of the organism's surroundings in
order to control, or "understand" experience.)

According to Polanyi:

We find the same pointed character that intellectual passions invariably possess in the force of drives, the lure of lust, the grip of fear. We have indeed acknowledged such drives before as the most primitive manifestation of the active principle by which we grasp knowledge and hold it. (1958, pp. 172-173)

Chapter 2 identified intellectual passions as a major component involved in making sense out of experience. (There were three components: foreknowledge, intellectual passions, and the structure of knowing.) It was said that intellectual passions house the desire that propels or compels one on towards the verification of the "conceptual" beliefs held in foreknowledge. The premises implied in our beliefs (foreknowledge) can only be known focally after the foreknowledge becomes knowledge (Polanyi, 1958, p. 165).

Discovery . . . terminates the problem from which it started, but it leaves behind knowledge, which gratifies a passion similar to that which sustained the craving for discovery. Thus intellectual passions perpetuate themselves by
their fulfilment. (Polanyi, 1958, p. 173)

Intellectual passions are thus important constituents of thought.

The term intellectual "passions" also implies that there is an emotional component involved and yet, emotion is the type of sentiment that one would normally assume we are trying to avoid in "rational" thought. To Polanyi, however, the emotional joy of discovery in scientific thought is not merely a psychological by-product of discovery, but is a necessary part of science.

The passionate origins of science respond to an essential quality in a scientific statement: that the statement is "intellectually precious" to science. Thus, Polanyi says, the question is not whether or not emotional claims are or should be a part of thought, but whether or not the rightness of these emotional claims can be justified (1958, p. 134).

Because intellectual passions are also attached to an articulate framework, the articulate powers of man also extend the range of intellectual joys to whole systems of cultural gratification, and:

This wider perspective brings us back to the fact that scientific value must be justified as part of a human culture extending over the arts, laws
and religions of man, all contrived likewise
by the use of language. For this great articulate
edifice of passionate thought has been reared by
the force of the passions to which its erection
offered creative scope, and its lasting fabric
continues to foster and gratify those same
passions. (Polanyi, 1958, p. 173)

By justifying the rightness of its emotional claims, science
sustains the whole cultural system of which it is a part.

It is by virtue of the passionate component then, that
science becomes part of a system of utterances that tries
to evoke and impose correct modes of feeling, Polanyi claims,
just like art, religion, morality, law, and other constituents
of culture. By moving into this context, science becomes
akin to a work of art, which calls attention to its beauty
as a token of artistic reality; science calls attention to
its value, ingenuity, and beauty as a claim to representing
empirical reality (Polanyi, 1958, p. 133).

As discovery becomes part of established knowledge,
students and laymen are attracted to it by intimations of
its beauty yet hidden to understanding: "a beauty which
is re-discovered every time a new mind apprehends a
theory" (Polanyi, 1958, p. 172). It is because of its
remote beauty that a theory continues to be valued as an
intellectual triumph and as a great truth, and not because of its few useful formulae. Appreciation of science, Polanyi says, depends on an appreciation of such beauty by the public; intellectual passions continue to pulsate in the common valuation of science (Polanyi, 1958, p. 172).

According to Polanyi, there is thus a similarity between different kinds of order and beauty, whether discovered in nature, conceived in mathematics, or imaginatively created in art. The relation is closest, he says, between pure math and the abstract arts, such as music or abstract painting (Polanyi, 1958, p. 193).

The preceding has described the manifestation of intellectual passions. They stem from the active principle, a primordial urge that is manifested as drives or exploratory movements at the prearticulate level of intelligence, and as intellectual passions at the articulate level. However, even at the prearticulate level, Polanyi says, it can be seen that chimps derive pleasure from the discovery of a new manipulation, quite apart from its purely practical benefits. They will go on performing the manipulation for its own sake, as a kind of play. This, he says, prefigures the joys of discovery—the kind of emotional satisfaction implied in the term "intellectual passions" (Polanyi, 1958, p. 133). At the articulate level of intellectual
life, passions are manifested by the individual's commitment to theory, appreciation of an articulate system such as science, and valuation and appreciation of a theory or a system of thought.

That science is a system of beliefs and values to which we are committed (Polanyi, 1958, p. 171), and that all our cultural values, including science, represent the historical deposits of a succession of intellectual upheavals (Polanyi, 1958, p. 158), is not only due to the presence or manifestation of intellectual passions as constituents of thought, but to their function as well.

The Function of Intellectual Passions. In the preceding section, it was seen that intellectual passions at the prearticulate level of intelligence are characterized by their mainly practical orientation: intellectual passions are manifested as urges and drives that compel or impel the organism on towards satisfaction of those drives. We have also seen that at the articulate level of intelligence, these passions take on a new orientation. At the articulate level, intellectual passions are not only oriented towards the practical, but also towards the aesthetic. Intellectual passions respond to aesthetic criteria in two ways: selectively and heuristically.

The selective function of intellectual passions is to assess scientific interest by affirming the existence
of harmonies which foreshadow an indeterminate range of future discoveries (Polanyi, 1958, p. 143).

The selective function is necessary because, within two different conceptual frameworks, the same range of experience may affirm the same facts as either evidence or counter-evidence of the correctness of a theory. Cases in point are Einstein's theory of relativity and the Copernican system. How did their conceptions or theories win over those of Newton and Ptolomy respectively? On what basis were their theories accepted, or selected? According to Polanyi, the selection was not based on induction, but on criteria of internal rationality, which shows the power of theory over facts (Polanyi, 1958, p. 167).

Sometimes the selective function will operate in such a way that there will be exposed a clash of intellectual passions, due to conflicting systems of thought that are rooted in different conceptions of experience. The nature of conflicts is thus not always due to strictly scientific arguments, but to conflicts between rival scientific visions or values, separated from each other by logical gaps (Polanyi, 1958, p. 151).

The second function of intellectual passions is heuristic. This function serves to evoke intimations of specific discoveries and to sustain their pursuit, sometimes
through years and years of labor. Scientists spend their lives trying to guess right, and are sustained and guided, Polanyi says, by heuristic passion (1958, p. 143). The act of formalization is the act of casting the result of the heuristic process of groping towards the satisfaction of intellectual passions (Polanyi, 1958, p. 190). The scientist, however, must be able to distinguish beauty from formal attractiveness. He must be both gifted and trained, for experience is an indispensable clue.

Scientists advance science in order to grope for the meaning of facts, for meaning is elusive and indeterminate; by accepting a theory as a true statement, scientists do not eliminate indeterminacy of meaning, but only restrict it (Polanyi, 1958, p. 150). We saw in chapter 2 how the application of a conceptual framework to experience not only limits one's vision of reality, but de-limits one's range of vision so that one is actually able to see. This is the purpose of theory—it is the articulate manifestation of man's vision of an aspect of reality.

We have seen that theory may be right or wrong. This is evidence of the delicate criteria of scientific value. The great scientific controversies of the past show that scientists hold and have held "scientific" beliefs about the nature of things. This is because, at the
heart of scientific controversy, as Polanyi shows us, beliefs and valuations function as joint premises in the pursuit of scientific inquiries (Polanyi, 1958, p. 161). There is thus a relation between belief and inquiry. We proceed, Polanyi says, with what we expect, and we expect in accordance with our successes. Our premises (values and beliefs) become the operational principles, or maxims, that function subsidiarily in the pursuit of knowledge, and in scientific inquiry. These premises can only be known focally through analysis, after the fact. Thus, the actual premises of science today are present only in the unformed discoveries in the minds of our researchers. One may dimly observe the premises of prospective discoveries, Polanyi says, through intuitive apprehension of a great master that has filtered through to an inner circle of collaborators (1958, p. 165). That, Polanyi says, is as close as we can get, until our "foreknowledge" becomes knowledge.

Authority and Tradition. Because of the delicate character of scientific value, a scientist accepts the authority and traditions of science as a competent—not a supreme—authority, for identifying the subject matter of science. In doing so, he admits the possibility that even very great scientists of the past
may be mistaken (Polanyi, 1958, p. 164). In accepting to be a member of the scientific community, the scientist becomes directly or indirectly accredited by all; the system extends into the past, as the same set of persons are recognized as masters, and a common tradition is derived (Polanyi, 1958, p. 163). In this way, science seeks to progress towards a knowledge of objective truth, even though there ever lurks a great possibility for error.

Summary of Intellectual Passions. Evidence of the delicacy of the criteria of scientific value (the fact that theory may be mistaken, that there is a history of great speculative discoveries, and that there is a history of great scientific controversies) indicates that discovery—and the formulation of knowledge—is accomplished through the selective and heuristic functioning of the intellectual passions, guided by the tacit powers of invention, observation, and interpretation, and measured against internal standards of rationality and a sense of beauty as evidence of contact with reality.

Scientific value cannot be defined in precise terms, but can be quite reliably assessed (publications and research grants indicate that this assessment is going on constantly) (Polanyi, 1958, p. 136). Scientific value is the joint outcome of three criteria or factors:
(1) certainty or accuracy; (2) systematic relevance; and (3) intrinsic interest (Polanyi, 1958, p. 136). Polanyi gives a number of examples of how these three criteria interact in the determination of the scientific value of discovery. A deficiency in one is compensated for by the excellence of the other two. For example, Darwin's theory of evolution, although it had little direct evidence for it (criteria 1), fit into a mechanistic system of the universe (criteria 2) and talked about the origin of man, which is of the utmost intrinsic interest (criteria 3). Thus, the accuracy of any statement does not, as a sole criterion, make it valuable to science. Just as two criteria of right perception, such as sharpness of contour and reasonableness of image, combine in determining what the eye will see, so two criteria of scientific value may combine in determining the scientific value of "facts". As we saw in chapter 2 in Polanyi's passage concerning the interpretation of sensory impressions, the eye sees details not there if they fit in with a sense of the picture, and overlooks them if they make no sense. So too, little scientific certainty will be enough to claim its value if it fits in with a great scientific generalization, whereas stubborn facts will be set aside if there is no place for them within the
established framework of science—for example, Polanyi says, the facts of E.S.P.

Regarding the legitimacy of criterion 3 (intrinsic value), Polanyi says that certain things are more interesting in themselves. For example, living animals are more interesting to study than dead ones; a dog is more interesting than a fly; man's moral life is more interesting than his digestion, etc. Subjects that are most interesting in themselves do not lend themselves to accurate observation and systematic study, Polanyi goes on to say, but they may still be of scientific value. Intrinsic interest depends on man's pre-scientific interests, his pre-conceived notions and values (Polanyi, 1958, p. 139).

Polanyi is worried that a strictly objectivist framework of science will mean that knowledge of all experience will be equal to knowledge of all atomic data (reductionism), and will consequently de-nature vital facts of man's existence. The educational implications of a framework that leaves out "vital" facts of man's existence will be part of discussions concerning educational objectives (chapter 4) and educational evaluation (chapter 9).

Summary of Chapter 3. Chapter 3 sought to convey the scope of Polanyi's philosophy, as evidenced in the following
continuums: (a) the continuum from prearticulate to articulate manifestations of tacit faculties—that is, from the three types of animal learning to the articulate frameworks of the distinctive sciences; (b) the roots of the prearticulate faculties in animals that extend to expanded inarticulate faculties in man—that is, from contriving, observing, and understanding in animals to invention, observation, and interpretation in man; (c) the manifestation of intellectual passions at the prearticulate level of intelligence to their manifestation at the articulate level—that is, from exploratory movements and drives to intellectual passions.

Polanyi holds that the following are responsible for what is at the articulate, or uniquely "human" ends of the above continuums: (1) man's innate capacity for language, and (2) his development of this innate capacity into articulated systems of thought (the "languages" of particular cultures and their corresponding development into formal systems of thought). In this sense, even science can be regarded as a "cultural" value, as is music, art, and religion.

We saw in chapter 2 how a conceptual framework is the tool or instrument by which one experiences comprehendingly. Articulate systems of thought are external guides that, once
assimilated to a conceptual framework, are able to function subsidiarily, as internal guides that both sustain and modify the conceptual framework as it is applied to experience.

It is in this way that a fiduciary framework arises out of a conceptual framework that is sustained by language. The beliefs and presuppositions that underlie particular articulated systems of thought are enshrined or embodied in the language of those systems, and as the systems are assimilated, the presuppositions and beliefs are assimilated also, and become the guiding principles that organize the interpretation of experience.

We "commit" ourselves passively at first, by being born into and growing up within a culture: we learn its language, customs, and traditions and consequently, its values and beliefs, by "osmosis"—a form of "passive" commitment. We eventually commit ourselves more actively through formal education, by utilizing or dwelling in systems of thought that constitute our intellectual heritage (by learning the language, customs, and traditions of the disciplines, or particular, formal systems of thought). By dwelling in formal systems of thought, we expand our tacit powers of understanding by crossing logical gaps that have already been bridged by great
minds of the past who have contributed to the shaping of those traditions--in other words, that have "shaped" the knowledge contained within. As individuals, we participate in the upholding of this knowledge through valuation and appreciation: intellectual states that reflect the satisfaction of intellectual strivings at the "human" end of the continuum of intellectual passions.

Because all knowledge is tacitly rooted, man actively participates in the shaping of knowledge, either through: (a) its discovery or formulation (heuristically at the personal level and selectively at the interpersonal level); or (b) its valuation (through understanding and commitment to its standards).

Because the shaping of knowledge is actually the shaping of a conception (see chapter 2), explicit knowledge is actually an intellectual tool of immense power in man's striving to understand experience.

There is no doubt that in Polanyi's philosophy, the capacity to think is man's greatest attribute. Polanyi equates thinking with knowing, grasping meaning, understanding---for all have the same structure---and shows how fundamental tacit powers that are exercised by the assimilation of articulate frameworks can be extended in their power. Man's capacity to think can thus be extended to the point
where he can formulate a rational theory of the universe, as he senses rational patterns or harmonies that are independent of him, yet that signify the presence of reality and hence, of objective truth (chapter 1).

To understand Polanyi is to understand how knowledge that is "objectively" true is not so because of its method, but because of its reflection of what is rational in nature. As stated in the introduction, the theme of rationality is like a crystal that resonates throughout Polanyi's work--even when it can't be seen directly--casting a coherence and clarity over the different patterns of his thought, and over his conceptual distinctions between such terms as objective, truth, reality, knowledge, science, and culture.

Polanyi believes in a rational universe, in a tacit power of man to arrive at knowledge of this universe, and in the "repository" role of culture as custodian and guardian of this knowledge. Because of this special role of culture, it follows that, to Polanyi, culture would be the indispensable mediator between man (the individual) and reality.
Educational Implications

Chapter 4: Curriculum

Introduction. The question of curriculum is the question of what to teach and why. In order to answer this question, curriculum must be viewed as the means to the ends, or aims, in education.

Aims may be general, as, for example, the particular view of man that an educational curriculum supports, or aims may be more specific, as, for example, a curriculum that would promote the satisfaction of the criteria of what is considered "successful" schooling.

This chapter will discuss two rationales for a liberal education curriculum: one rationale that addresses the "view of man" aim, and another rationale that addresses the "criteria of successful schooling" aim. It will be seen that Polanyi's philosophy supports both rationales.

The "View of Man" Aim. Liberal education basically promotes the idea of an education of man for man. As such, it aims to cultivate powers that man shares with no other species—"clear thinking, enlightened cherishing, and humane judgment" (Broudy, 1980, p. 50). The aims of liberal education thus go far beyond specialized training for an education.
Liberal education also implies a conception of human nature that is opposed to a materialist conception of man. It implies a view of man as a being possessing uniquely human powers of understanding, abstracting, judging and reasoning. Espousing this latter view of man, claims M. Adler, implies that educational consequences following from such a view would be different from those derived from a strictly materialist conception of man (Adler, 1988, p. 74). Klinefelter amplifies Adler's view of how the spirit of secular humanism prevalent in educational institutions today affects the goals of liberal education. He says that the humanistic doctrines of determinism, environmentalism, and mechanism do not even permit educational aims to talk about liberal arts as prerequisites to all other studies, because the end goal of such studies is to produce men freer of ignorance, free to serve God and man, and free to pursue happiness, wisdom, or any other virtue (Klinefelter, 1975, p. 376).

Liberal education clearly implies a conception of man that is more than a strictly mechanistic theory can allow, and Polanyi's philosophy supports such open-ended goals for man as those described above. It is evident from Polanyi's philosophy that he regards man's tacit faculties as continuous with the tacit faculties of
animals. However, although these same tacit faculties are the coefficients of man's ability to reason, to judge, and to value, it is these latter abilities that characterize man as unique. Man is a rational animal because he has rational powers and abilities that have been expanded through language, and achieved in the development of an intellectual life through the assimilation of the intellectual and social traditions sustained by language. Man may be considered rational insofar as he cultivates his tacit powers through the assimilation of the articulated frameworks that he has collectively developed. Polanyi's view of man's rationality is thus consistent with Adler's view of the nature and means of man's rational powers, and consequently supports Adler's argument for a liberal education based on such a conception of man.

If man is a rational animal, constant in nature throughout history, then there must be certain constant features in every sound educational program, regardless of culture or epoch. The basic education of a rational animal is the discipline of his rational powers and the cultivation of his intellect. This discipline is achieved by the liberal arts, the arts of
reading and listening, of writing and speaking, and, perforce, of thinking, since man is a social animal as well as a rational one and his intellectual life is lived in a community which can only exist through the communication of men. The three Rs, which always signified the formal disciplines, are the essence of liberal or general education. (Adler, 1988, pp. 74-75)

The "Criteria of Successful Schooling" Aim. A second rationale for liberal education has been developed by H.S. Broudy, and has to do with "successful" schooling criteria. Broudy draws extensively on Polanyi's concept of the tacit to develop his argument.

Broudy claims that some people do not believe that any education other than specialized training is worth cultivating because, on the two most commonly used criteria for the success of schooling, general or liberal studies are a failure. Broudy identifies these two common criteria of instructional effectiveness as follows: (1) replicative ability, or, the learner's ability to recall content of instruction (in school tests and national poll tests, these results have been disappointing); and (2) applicative ability, or, the learner's ability to apply theoretical
knowledge (Broudy, 1980, p. 50).

The argument against liberal education based on the low results of the preceding criteria of recall and application says that, since we don't usually remember the details of what we've learned after formal schooling ends, and since we can't apply general knowledge to specific occupational tasks, we might as well leave the idea of liberal education aside. Furthermore, the accountability movement in education leans on the dogma of behavioral objectives, insisting on tests for the presence of these behaviors after instruction. The implication is that if it cannot be tested, it cannot be worth learning (Broudy, 1980, p. 52). (Note: the implications of Polanyi's philosophy regarding behavioral objectives will be discussed in chapters 6 and 9.)

There are other ways that knowledge can function, Broudy says, in addition to either being remembered or being applied, and these other ways are based on Polanyi's concept of tacit. Knowledge can function tacitly, and can be measured indirectly in terms of broad life outcomes:

There is reason to believe that persons who have studied certain disciplines the details of which they cannot recall nevertheless perform differently on reading and discussion tasks
involving concepts from these disciplines than those who have not studied them. (Broudy, 1980, p. 52)

In addition to the recollective and applicative uses of schooling, Broudy claims, there are two other uses that have to do with the "tacit", rather than the "explicit" functioning of knowledge: the associative and the interpretive uses of schooling.

The **associative** use of schooling implies:

the connection of an item of experience with concepts, images, relations, encountered in formal study. Sometimes the association can be described and explained by the laws of association (resemblance, recency, contiguity, etc.); sometimes explanation requires psychoanalysis, and some associations are inexplicable by any means. (Broudy, 1980, p. 53)

The **interpretive** use of schooling implies the translation of experience or discourse from one set of concepts to another, or from one context to another—for example, the interpretation of a tornado by the concepts of physics (Broudy, 1980, p. 53).

The interpretive and associative uses of schooling do not require the precise reinstatement of content that had
been studied formally; indeed, for such uses, Full recognition of learned inputs may be a hindrance rather than a help. I shall argue that cognitive, imagic, and evaluational schemata develop as a consequence of formal schooling, and that these are used tacitly by the Self in all experience, but especially in interpretation and association. (Broudy, 1980, p. 52)

Broudy claims that a liberal education is both a necessary and a sufficient condition for the associative and interpretive uses of knowledge. (On the other hand, liberal education is not a necessary, nor a sufficient condition for the replicative use, and it is a necessary, yet insufficient condition for the applicative use.) (Broudy, 1980, p. 54)

In other words, the rationale for a liberal education curriculum in terms of knowledge uses has to do specifically with the functioning of tacit knowledge, and the philosophical basis for this rationale is found in Polanyi's theory of the tacit.

As regards the rationale for liberal studies, the important meaning of tacit is that it denotes an item not now explicitly in the center of attention, although when being studied it was
at the center of the pupil's attention. However, tacit covers theories, world views, and schemata of all sorts insofar as during an interpretive act they are the "spectacles" through which we see but which we do not see. (Broudy, 1980, p. 55)

In chapter 2 of this essay, we saw how a conceptual framework is really an instrument of perception, a tool that is analogous to the "eye", rather than to a "map" (the usual analogy). We also saw that, as a tool, a conceptual framework is an interpretive framework for experience, insofar as it provides a context for understanding and meaning. In Broudy's words, subsidiary context enables focal material to be understood, and,

Where disciplines have not been studied formally, gaps in the subsidiary context prevent the focal material from being understood . . . . it might be argued that the goal of a general or liberal education is to fund the mind explicitly with contents that in time will become tacit resources for the building of contexts. (Broudy, 1980, p. 55)

One may well ask the question, what does the specific general content of a liberal education have to do with the consequence of "tacit" outcomes? Can we not practice associative and interpretive operations explicitly,
instead of relying on the transformation of specific inputs into tacit outcomes?

The answer to this question, Broudy claims, lies in the very notions of interpretive and creative associations, which preclude automatic recall as equivalents (Broudy, 1980, p. 53). In other words, the very meaning of the words association and interpretation implies that we cannot prescribe the outcome of these processes in advance. Specific curriculum provides specific structures that function tacitly, rather than prescriptively, in the interpretation of experience. Furthermore, the distinctive structures of the different intellectual disciplines found in a liberal curriculum provide the richest sources for contexts of interpretation, for their refinement is on-going, and has been going on at least since the days of classical Greece. (Phenix's account of the traditional disciplines, or forms of knowledge, as "realms of meaning" will be discussed in chapter 8.) According to Broudy,

The most refined concepts and classifications are supplied by the intellectual disciplines—the ones studied in school. Each discipline is made up of entities, relations, facts, laws, and modes of enquiry peculiar to itself. They make up its distinctive structure. This structure remains
after most of the school lessons that were used to explicate it have been forgotten. Each discipline leaves a residue that, like a stencil or honeycomb, reveals a distinctive design when placed on experience . . . . the schemata persist, so that . . . certain . . . patterns prod them into providing contexts for association and interpretation. The result may take the form of a new image or an inference or a value judgment . . . . These structures or stencils serve as subsidiaries for the interpretation of the objects at the focus of knowing and understanding. We have to suppose that the school input consisted of explicit attention to the details of the separate disciplines in order to elicit these structures. The structure, to use Polanyi's term, was apprehended by means of the details. Later the structure itself became a subsidiary for supplying a context of meaning to a problem, a piece of discourse, and so forth. It is not anomalous to say that the details must fade into relative oblivion for the structure to function interpretively. And it must be reiterated that attempts to bypass the study of the details in
the first instance in favor of studying the structure directly may not be productive, as many schemes of general education that have tried to take this short cut have demonstrated. (Broudy, 1980, p. 59)

Summary. Polanyi's account of the development and expansion of the tacit faculties, and his theory of tacit knowing provides a rationale for the goals of a liberal education. Not only does tacit theory justify these goals, but it also challenges the opposing claim that (a) knowledge that cannot be remembered or applied after formal schooling is over is not worth learning, and (b) knowledge that cannot be tested in the form of specific behavioral objectives is not worth considering. There is not a one-to-one correspondence between explicit inputs in education and explicit outputs--nor should there be, according to tacit theory. The explicit inputs of schooling may become transformed into imagic-conceptual resources for subsidiary functioning--a tacit output. Understanding of focal material in experience relies on the fluidity (associative use) of a tacit structure for meaning (interpretive use). Liberal schooling is important insofar as it is the most refined content source available, in terms of distinctiveness, clarity, and coherence, and is thus able to fund richer subsidiary structures.
Chapter 5: Educational Decisions

Introduction. This chapter will focus on the relation between fact and value, as it affects educational decision-making. Using Polanyi's views of: (a) the nature and meaning of "objective", and (b) the nature and functioning of a conceptual framework, it can be argued that assumptions regarding value neutrality in decision-making are false. Thus, the practice of ascribing formally rational grounds in defense of decisions does not imply a value-free decision, as is supposed and intended. Rather, it implies a decision that neglects to account for the role of informal, or tacit evaluative processes that are partly guided by the presuppositional values and beliefs to which the decision maker is committed, and to which he/she tacitly ascribes as part of his/her social, moral, and intellectual upbringing.

A recognition of the role of these informal processes in decision-making implies the need to assess the nature of those values and beliefs in order to justify one's tacit endorsement of them through educational decisions and practices.

Objective Knowledge and Frameworks of Commitment. Polanyi's philosophy shows us that there is no legitimacy to either the claim or the ideal of purely objective knowledge in the objectivist sense. What we commonly call
objective knowledge (knowledge of the world of facts) is not the outcome of detached, unbiased, and value-free observation, as objectivists would claim. We find two arguments against this objectivist notion in Polanyi's work. (1) The observer (discoverer or knower to Polanyi) is attached to his knowledge, in the sense that he forms part of the tripartite structure of knowing or discovery. (2) Knowledge is also biased in the sense that any act of discovery or knowing is guided by a conceptual framework that presupposes values and beliefs to which the knower or discoverer is committed.

We have seen in chapter 2 that one cannot discover anything without such a conceptual instrument, for what is discovered is, by definition, external to the discoverer. We have also seen that the very act of dwelling in this framework, of using it as an instrument, implies commitment to its standards. One will therefore see or discover only what one presuppositionally believes to be there, or what one "conceptually" believes to be there due to the function of foreknowledge. In the case of an objectivist, scientific framework, the implication is that the discoverer who is committed to this framework will ignore evidence of what, in Polanyi's view, is essentially human: man's innate tacit powers that enable him to selectively and evaluatively
respond to essential features of objective knowledge, features that alone reveal truth. (It is important to remember that, when Polanyi talks about "objective" knowledge, he means it in the sense of objective "truth". "Personal" knowledge may be true or mistaken; if true, then personal knowledge is also objective knowledge, and if mistaken, then personal knowledge is also subjective or idiosyncratic knowledge.)

Man must cultivate his tacit faculties if he is ever to arrive at truly objective knowledge, even if such knowledge can never be completely objective (due to the fundamental indeterminacy of knowledge and to the personal participation of the knower in the shaping of knowledge). Thus, knowledge that is objective in Polanyi's sense of objective is so by virtue of its being connected to reality for its truth, and connected to man for its shaping.

The Fact-Value Relationship. The inseparability of fact (objective truth) and value (evaluative judgments in Polanyi's philosophy of personal knowledge) focuses on a central problem that is revealed in many of our educational practices. We end up obscuring the fact-value relationship as we insist on distinguishing fact from value, and subject from object. Knowledge is never disconnected from man (and thus, from his values), although
knowledge may be disconnected from reality (and thus, from truth).

W.T. Scott identifies the problem of the misunderstanding of the role of commitment and its educational effects in the following manner:

In relation to the education of young people, the uncertainty about truth in general, about particular truths, and about values and emotions leads to conflicts or at least contrasts among commitments of teachers to methods, to subject matters, and to the sensibilities of their pupils. (Scott, 1977, p. 194)

We also see such a practical dilemma expressed in the words of Emily E. Robertson:

Sometimes it must seem to students that we exhibit approach-avoidance behavior about making a difference in their lives. On the one hand, we invite them to share our world; but on the other hand, we keep subjecting that world itself to the sort of criticism that makes commitment difficult . . . . A special scrupulousness is required of teachers because we pass on standards for assessing truth as well as particular truths; thus it is fitting that we be as explicit as we
can about the intellectual perspectives and research styles we have adopted. But sometimes this self-consciousness may get in the way of achieving our pedagogical goals. Some courses in research methods, for example, introduce students to a wide range of quantitative and qualitative research methodologies with explicit attention to the strengths and weaknesses of each. But how are students to learn to see through our glasses if, at the very same time, we keep making them examine the cracks and dust on the lenses? (Robertson, 1982, p. 103)

The philosophical roots of the problem of the relationship between fact and value is the assumption that one cannot deduce values from facts, and thus, values and morality cannot be an object of reason (Klinefelter, 1975, p. 368). We therefore feel obliged to endeavour to keep reason and morality separate in our educational practices. For example, we are careful to give moral views in such a way that we tacitly endorse the ideal of "follow the argument", and not "follow me" (Robertson, 1982, p. 102). In Robertson's view, this constitutes a substitution of the rational authority of persons for the authority of arguments. We accept this practice because of our tacit endorsement
of the separability of fact and value, an assumption that is challenged by Polanyi's philosophy.

Believing in a fact-value division, it follows that our vigilance in avoiding the rational authority of persons would be rooted in the fear of the danger of indoctrination and corruption of the minds of students, and of a non-respect for the autonomy of students as independent centers of thought and action. (Robertson, 1982, p. 102)

On the other hand, an increase in the formal rationality of judgment leads to the danger of a poorer overall quality of judgment—for judgment, according to Polanyi, is an informal, tacit process that is sustained by tacit powers. Standardization of criteria of judgment may lead to the institutionalization of blind obedience to rules. For example, I am reminded here of Inspector Javert in Les Misérables, who had so upheld the rational authority of moral right and duty all his life, and with all his being, that he became the embodiment of that right. Consequently, his mind lost its resilience, its tacit ability to judge and to "fine-tune" reason. At a critical moment in his life (and in the story), the moral contradiction presented to Javert's mind and represented in the person of Jean Valjean, ended up breaking Javert's mind and destroying him, for his mind had lost its power to serve him through a lifetime of blind obedience.
When the authority of reason—on which Javert's mind had sustained its life—was threatened, the only resolution was tragic self-destruction in the form of suicide.

In generalizing a belief in the separability of fact and value, we will fail to see that the issue is not so much that an educational institution become the inculcator of a particular set of values or moral virtues, but rather that it is the purveyor of certain values, and cannot avoid being so "any more than the knowing subject can avoid tacitly or explicitly exercising his value orientation in the selecting, organizing, hypothesizing, and experimenting that constitutes the act of knowing" (Klinefelter, 1975, pp. 376-377).

Going back to the example of Inspector Javert, the penal institution of which he was a part was the purveyor of the value of justice, and demanded that any member committed to this value exercise his commitment through punishment of a criminal and through the hypothesis that a person convicted of wrong-doing was a criminal and thus deserved to be punished. What the penal institution could not do, by virtue of its function, was to supply an alternative meaning for criminal. A "criminal" could mean only one thing: someone who had done wrong and was convicted.
If a person had done wrong but was not a criminal in the full sense of the term, due to the weight of the circumstances surrounding his act (eg. Jean Valjean), then this person could not be accommodated within the penal system of which Javert was a part. Accommodation, and thus an alternative meaning for "criminal", could only be supplied from within a larger system of justice application—for example, from within the system of judge and jury.

**Implications.** In light of Polanyi's view of the nature of "objective" knowledge and its attendant assumption of the inseparability of fact and value, educationists have an obligation to become, in Klinefelter's view, more self-conscious about the relation between their personal commitments and "cognitive detachment" in curricular and pedagogical decisions. He advocates more, rather than less rational enquiry into the relation of means and ends, and into the possibility of discovering reliable tests of authority for educational goals. This picture of the aims of education would be compatible with the best we know because, he says, it would recognize the connection between means and ends, facts and values, and subjectivity and objectivity in the educational process—a connection forged by Polanyi's philosophy. (Klinefelter, 1975, pp. 376-377).
According to Klinefelter,

Far too frequently we forget that the spirit of "scientific objectivity" represents as much of a subjective commitment in its own way as the drama instructor's decision to involve her students emotionally as well as intellectually in the agony of Lear's act of self-discovery. (1975, p. 377)

J. Schwab also recognizes the fact that educational goals and intentions are complex, and actually represent the projected values of curriculum planners. He claims that the curriculum must thus be viewed as part of this larger body of human values whose consequences can only be appreciated as we are able to more precisely discern their meaning in the broadest possible sense. Schwab says that meaning can only become apparent in a process that combines felt experience with rational scrutiny. Felt experience will tell us something about the goal itself in relation to our values, and will thereby enable us to revise goals as we move along. In this way, educational aims remain relevant, cohesive, and feasible, and at the same time, reflective of a larger body of human values.

Schwab's "practical" orientation includes the development of specific arts as essential features within
a process or method of deliberation. The overall objective of his orientation is to enable the use of the richness of diverse theory and pluralism in order to arrive at an informed use of theory (knowledge of its powers and limitations) and thus, an informed choice of theory. The relevance of Schwab's method to Polanyi's thought is that he clearly recognizes the need for theory to be mediated by "personal" arts that supplement theory with knowledge derived from this other, more personal source. Schwab's knowledge of "felt experience" would be what Polanyi would call tacit knowledge.

The connection between factual and evaluative judgments in human action also suggests that there are rational ways of determining whether or not the values we are communicating in education are worth it. (In a paper entitled "Value in Education", Johanna Burgess provides an excellent account of a practical method of rationally justifying value criteria in education. The reader is invited to refer to this paper as an example of a method that ties in with Polanyi's thought.

Polanyi's philosophy also suggests that the mind itself is the most sensitive instrument of evaluation we possess—albeit, a tacit one. Our explicitly stated fears of indoctrination and falsity, and our explicitly stated beliefs in "respect" for the student and his "autonomy"
should not make us run away from the responsibility for the consequences of our values and beliefs. Polanyi's philosophy tells us that, in fact, we cannot run away from this responsibility, for the consequences are a part of action in the form of choice and orientation. This is the real meaning of the inseparability of fact and value.

Our task is thus to question the assumptions that reveal which values and beliefs guide our actions and decisions. In W.T. Scott's words,

> The more general philosophical problem of reason and emotion can now be seen to be converted into a question of which emotions or passions for satisfaction are involved in questions of a rational type. (1977, p. 204)

A determination of which values and beliefs guide decisions is the first step towards reinstating the rational authority of persons over the rationality of one argument pitted against another in educational decision-making, while simultaneously protecting students against indoctrination. Educators must endeavour to make explicit the content, goals, and methods they are committed to, as well as the tacit assumptions that these decisions reveal and the values and beliefs that these assumptions endorse.
Summary. In showing that there is no such thing as objective knowledge, in the sense of being observer-detached and value-free, Polanyi's philosophy is able to inform current educational practices that explicitly "intend" to be value-neutral and value-free. For example, a pluralistic bias pretends to be neutral among competing doctrines, while by its very nature it systematically discriminates against any doctrine claiming exclusive possession of truth (Klinefelter, 1975, p. 374).

Another example of the tacit endorsement of institutional values is the granting of research monies, actual research projects, graduation requirements in colleges and universities, the choice of curriculums, etc. Value neutrality is a myth, and Polanyi's philosophy shows us why it cannot be otherwise. By leaving the myth aside, this does not mean that we will fall into subjectivity in the world of values. For, as we have seen, Polanyi's philosophy also shows how subjectivity is avoided in his theory of personal knowledge—for it ever seeks to join man with truth. Klinefelter's conclusion is that

Polanyi's theory of personal knowledge seems to say that valid choices can be made among competing values and conflicting ends and means by an act of one's disciplined subjectivity
dwelling responsibly within the unspecifiable particulars of tacit knowledge in order to test one's fundamental intimations of reality.

(1975, p. 373)

By striving to make educational practices, assumptions and beliefs public and explicit, educationists will on the one hand, be protecting themselves against self-deception and bandwagon effects by self-criticism, and on the other hand, be moving towards greater accountability.
Chapter 6: Methods and the Educational Experience

Introduction. This chapter will discuss Polanyi's concept of emergence in relation to the act of knowing. Emergence is a concept that is being "newly" introduced to this paper, and the following reasons will explain why the concept is being presented at this point.

First of all, although the emergence concept is indicative of the scope of Polanyi's philosophy along a vertical plane, this (vertical) dimension was not included in chapter 3, for chapter 3 focussed on the scope of Polanyi's philosophy along a horizontal plane of continuums (from prearticulate to articulate in powers and passions). Secondly, the concept of emergence seems to be more biological than philosophical in nature, and Polanyi's "biological" concepts seem to point to another major branch of his philosophy that is informed by his scientific, chemical background, yet that has a very strong and important bearing on his total philosophy of knowing. This bearing will be explored in this chapter, in order to show the nature of the relationship between methods and educational outcomes. The focus will be on the relationship, for this is the aspect of "methods" that Polanyi's philosophy most clearly addresses. The term "educational experience" used in the title of this chapter was chosen in order to suggest the area between methods and outcomes (the relationship) that is being highlighted.
The Philosophical and Biological Nature of Knowing.
Polanyi's theory of tacit knowing indicates that the act of knowing is both a highly skilled, yet a very creative act. This seems rather paradoxical, and it is only by introducing Polanyi's concept of emergence that we are able to see how both aspects of knowing are equally well-founded in his philosophy.

"Knowing" is skilled, in the sense that the knower's attention is focussed on the composite integration of particulars, and not on the particulars themselves. Through the process of indwelling, or dwelling "in" the subsidiaries, integration, or achievement, is accomplished.

Polanyi uses the term "achievement" as analogous to the term "integration" when he is talking about the tacit acts of any living organism, human or animal. However, it is not a haphazard or casual juxtaposition of terms; rather, the analogous use of the terms points to a fundamental feature of all tacit knowing: knowing, besides being a skilled act, is also a highly creative act. There are no rules to account for a tacit integration. Although all the clues are present or known, the integration of those clues into a coherent pattern implies the intuitive grasping of an underlying principle that accounts for that coherence.

Polanyi talks often about the nature of discovery. It
seems to be his paradigm case that shows the creative aspect of any and all acts of knowing. Although the discoverer is the first to recognize pre-existent patterns of meaningful relationships (chapter 1) between clues, any future act of recognition of these same patterns of coherence by any other person is no less a creative act than was the original act of discovery. It is just that subsequent acts of discovery can be guided by the first person's discovery; logical gaps still have to be crossed by the knower, but there is now a model to follow. This in no way diminishes the importance of the creative act of the discoverer for, according to Polanyi, it takes a special type of genius to be the first to cross a logical gap that separates an aspect of something that is known, or has already been discovered, from an aspect that is unknown or has yet to be discovered. What makes any act of knowing "creative" is the crossing of a logical gap—the intuitive, informal grasping of a coherence, whether one is the first to do so or not.

In referring back to Polanyi's use of the term achievement to describe what he means by tacit integration, we will also see that the term achievement seems to imply much more than the dual "skilled" (a performance) or "creative" (no rules) aspects of tacit knowing just discussed.
The analogous use of the term achievement implies that integration is something that may or may not occur, regardless of the level of intellectual activity being referred to, whether prearticulate or articulate. In other words, organisms may succeed or organisms may fail (Polanyi, 1967, p. 44)—where to succeed implies that the organism has both taken account of relevant factors and has grasped their inter-relatedness.

The recognition of factors and the grasping of their connectedness is a tacit, unformulated act that to an animal (or man) may mean the difference between life and death. Although many factors may account for survival of both an individual member or a species of which that individual member is a part, no one factor (such as speed of response or survival of the fittest) can account for all the diversity and diversification of characteristics present in the conglomerate of organic life and organic systems. This is because tacit awareness is both an achievement and an integration.

It is an integration by virtue of the fact that all necessary conditions are present, and it is an achievement because something more than necessary conditions is operating. The tacit faculties underlying all adaptive behaviours—as seen in chapter 3, the ability to recognize
relevant features and grasp coherences—are the coefficients that underlie any adaptive behaviour in an organism's repertoire. This act of integration is unformulated and is in this sense creative, and must be so if it is to account for adaptation. If it were not, then evolution would not be a plausible theory, for it would not account for the adaptive characteristics of organisms and the simultaneous rise of complex systems of life. According to H. Prosch, the overall general direction of evolution is meaningless in terms of structure and capacity for attaining meaning and thus, chance natural selection cannot account for direction. Polanyi's claim, he says, is that the organism's creative reorganization of DNA is in response to a gradient of deeper meaning (Prosch, 1977, p. 181).

Integration is thus an achievement, a personal act that may succeed or fail. Tacit can thus be seen as a "boundary condition" in the evolution of complex life forms (Hodgkin, 1982, p. 110) in multi-layered meanings, and in the development of all thought. It is a power that cannot be accounted for by the specification of the elements and their relationships that are joined in integration. In other words, how integration occurs is not based on any formula, but on a prearticulate ability—a tacit faculty—that recognizes and joins not prescriptively, but intuitively.
As a result of achievement, an added quality is present in the comprehensive entity that cannot be entirely accounted for by its elements. The added quality of, for example, meaning, complexity, depth, or harmony can only be accounted for by rendering the tacit its due power as it operates at the boundaries between successive levels in a multi-levelled system. It is a boundary "condition" that establishes the upward, spiral orientation that we understand as growth, and as movement from lesser to greater quality in that growth.

The extra quality present in a comprehensive entity is what we are referring to when we say that "the whole is greater than the sum of its parts". One could never prove this by reducing the whole to its parts, for no "extra" part would be left over unaccounted for. The legitimacy of this statement can only be grasped intuitively.

General Implications Regarding Quality of Experience.

The preceding discussion of the dual skilled-creative nature of knowing included a description of Polanyi's concept of emergence and the boundary conditions that make emergence possible. The discussion is largely based on Polanyi's ideas contained in Part IV of "Knowing and Being" (Life and Mind) (1969, pp. 211-239). Polanyi's biological concepts describe how multi-levelled layers of life and
meaning emerge out of ambiguous boundary conditions that "leave room" for integrations according to two sets of operational principles—those of a lower, or subordinate level, and those of a higher, or superordinate level. Sentience can thus be understood as a structural feature of higher boundary principles of organization and operation, rooted in and dependent on a lower level (Prosch, 1977, p. 182). Thus, an emergent quality present in a comprehensive entity at a higher level can only be partly explained by the operational principles of its lower level. Polanyi gives the example of how the operational principles of physics and chemistry can be cited to account for the functioning of man as a biological organism, but do not account for the functioning of human consciousness, which can be regarded as an emergent quality in man.

**Educational Implications.** A number of educational implications related to "methods" can be derived from Polanyi's account of the dual "skilled-creative" nature of knowing, and of his notion of achievement in conjunction with the concept of emergence.

First of all, the skilled aspect of knowing implies that, just as in any skilled performance, attention can be focussed on particulars in two ways—either subsidiarily or focally. Applying this concept to education, we can
say that the same content can function differently. It can function as a focal awareness, as when it is being studied, or it can function as a subsidiary awareness, as a particular that is dwelt in, as when it is being used in the interpretation of an experience. S. Reese gives an excellent account of this dual functioning of content in his analysis of the relation between methods and aims of music education. He says that the structure of tacit knowing shows itself in listening to a piece of music. In listening, attention is focussed on the music as a whole—the movement of the music. The focus is on the aesthetic effect that the particular elements of melody or rhythm achieve. Awareness of these elements are, however, tacit. (Reese, 1980, p. 78)

The goal of formal study in music education (the other way of content functioning) is that such study will have an impact on the student's ability to experience music aesthetically. The assumption is that the more one does and studies in music, the more likely will he be to experience music aesthetically. (Reese, 1980, p. 75)

However, as Reese points out, some researchers have questioned the effects that certain types of formal music study (such as performance skill, listening skill, and analytic skill) have had on the development of musical responsiveness and perception. Furthermore, he says,
there is no clear evidence that by performing in a music group, students are actually growing in their sensitivity to, and appreciation of music, although such active involvement has always been interpreted as trustworthy evidence that they are. (Reese, 1980, p. 76)

What does all of this tell us about the relation between formal music study (focal awareness of content) and musical sensitivity and appreciation (subsidiary awareness of content), which is the goal of such formal study in the first place?

First of all, Reese says, it can tell us that detail or analysis is only important if it is relevant to the total musical experience. The importance of detailed study is limited to those things that can make a difference in the experience. Furthermore, because analysis, as a source of subsidiaries, has as its purpose the refinement of perception, then periods of study or analysis should be followed by periods of experience or integration (Reese, 1980, p. 87).

This is similar to A.N. Whitehead's view of the "principle of rhythm" in educational experience. He views education as a cyclical process consisting of three stages: romance, precision, and generalisation. In applying Polanyi's concepts of focal and subsidiary awarenesses,
we can say that content functions subsidiarily in the romance stage, that content functions focally in the precision stage, and that content functions subsidiarily in the generalisation stage of Whitehead's rhythm principle. The important point is that periods of study or analysis are followed by periods of experience or integration, and that the process is cyclical.

Another person who advocates the view of Reese and Whitehead—that methods in education should allow for the functioning of content as both a subsidiary and a focal awareness—is K.R. Conklin: "In every area of curriculum . . . appreciation and performance should be taught in alternating cycles, so as to enhance the theory-practice relationship" (1974, p. 67). Conklin also feels that one area of knowledge should be explored as deeply as possible in order to appreciate what depth means, since the goal of deeper understanding for appreciation and self-realization is more important, he claims, than any training for practical performance (Conklin, 1974, p. 67). (We are reminded here of Broudy's assimilative and interpretive uses of schooling discussed in chapter 4, as well as the notion of a "spiral" curriculum.)

Through cycles of appreciation (theory) and performance (practice), the student will have practice in performing
"inter-level" integrations and differentiations. The assumption is that the skill of these integrations and differentiations are more or less invariant from field to field, so that skill in one area of in-depth study transfers to another area of study as the particulars in the new area are mastered. (Conklin, 1974, p. 66)

It is thus depth of knowledge that is important to Conklin, as it is to Broudy, and based on Polanyi's theory of tacit integration, both Reese and Conklin feel that periods of formal study (analysis, detail, facts) should be followed by periods of experience aimed at integrating those studies (using the content in a subsidiary manner).

It should be noted here that right-left brain studies suggest that there is a physiological basis for the mind's ability to perceive in two ways—either "holistically" or "analytically", or, to use Polanyi's terms, either subsidiarily or focally (see appendix).

Polanyi's theme of emergence describes how a new quality can be present in an experience once achievement (or tacit integration) has occurred. This is another aspect of the "creative" nature of knowing, where logical gaps or schisms are crossed by the knower, which subsequently enables him to experience on a different level—for example, a level that is characterized by a greater depth of
understanding, a greater sensitivity or appreciation, or a greater meaning. These are all outcomes of tacit integrations that cannot be accounted for by specification or formulation.

Although they are aims of education, an understanding of how tacit integrations function in the generation of such emergent qualities, and of how they are nevertheless based on a defining ground of relevant content material, is provided by Polanyi's philosophy. It helps us see that certain types of formal study may not necessarily contribute to the types of outcomes that educators desire. This is borne out by Reese's examples, which stated that (a) students' performing in a music group does not clearly indicate increased appreciation of music; and (b) an emphasis on skills (listening, performing, analytic) does not necessarily develop perception in music.

Quality: Science and the Arts. Qualities such as appreciation, increased perception, and understanding are part of the "creative" aspect of knowing, and as such, they cannot be generated by formulated procedures, but from a base of subsidiary content that constitutes an interpretive framework. According to Polanyi, all knowledge of rests on knowledge from, and whatever we know from, we know tacitly. It is this tacit knowledge
that gives meaning and quality to whatever we know explicitly. If what we know from is constituted by a series of rules and specific techniques, then the functioning of content as a subsidiary cannot help but generate rather shallow meanings and appreciations as qualities of experience, for quality is an emergent feature that cannot be formulated by lower-level principles, but only from a content base.

This does not generally pose a significant problem in the "sciences", for these disciplines form part of the cold, hard world of facts, where meanings and appreciations and other such qualities are usually tucked away under the term "subjective". Behavioral-type objectives aimed at in the study of the sciences can more easily ignore aims that cannot be cast in objective terms, for such aims are considered outside the bounds of science anyhow.

The problem of quality of experience thus presents itself mainly in the field of the arts--we have already seen an example of this in the field of music--where the accepted aims of aesthetic experience defy "logical articulation" (Bowman, 1982, p. 75). The result is that, although it is usually recognized that the arts are basic to man's development, educators aren't really able to say exactly what form this contribution to development takes (Bowman, 1982, p. 75).
We can see how this ambiguity of goals, and consequently, of the intellectual value of the "arts versus sciences" program, has been reflected in attitudes and practices in education. For example, students have long considered science programs "tougher" than arts programs, and have long believed that greater intelligence is required to pursue a science program. Even at the high school level, advanced or enriched classes usually proposed that science, and not arts courses, be added to the curriculum as part of the advanced program content. At the elementary level, courses such as poetry, music or art were usually scheduled into a time slot (for example, "Friday" afternoons) that implied that intellectual vigour, rigour, and attention was not all that necessary on the part of the student (or the teacher) as was the "Monday" morning math class.

The search for objective criteria in the arts, says Bowman, leads educators to give a higher priority to specific technique rather than to abstract principle, and a tendency to fill instructional time with a maximum of facts, to the detriment of indeterminate states of wonder and awe (Bowman, 1982, p. 75). The superiority of things explicit means that even the preparation of music teachers is increasingly dominated by practical methods courses, rather than theoretical or philosophical ones (Bowman, 1982, p. 82).
Bowman relies on Polanyi's theory of tacit knowing, tacit interpretive schemata, and the concept of indwelling to explain how personal, nebulous, indeterminate states are equally valid goals in musical education, for from these states emerge all understanding, meaning, and significance relative to the individual's interpretive framework. The point, he says, is that both instructional success and instructional failure may share the same behavioral indications (Bowman, 1982, p. 82).

Among the instructional methods that Bowman suggests are the following: methods should be congruent with objectives; methods of instruction should enhance the intuitive, and should allow for diverse experiential opportunities and indeterminate outcomes.

In short, methods in education should make room for tacit interpretive schemata. They are by nature personal, ambiguous, and flexible, and they give rise to qualities of experience that are equally personal and indeterminate states, such as meaning, sensitivity, appreciation, and understanding. Such qualities have long evaded behavioral objectivization in the arts.

Summary. Two considerations arise from the preceding, in light of Polanyi's concepts of tacit knowing and emergence: one has to do with the field of the arts, and
the other has to do with the field of the sciences.

The field of the arts should not defer to behavioral accounts of learning and instruction. In other words, educators should stop the practice of compiling "endless lists of competencies whose concreteness presumably testifies to their authenticity" (Bowman, 1982, p. 75).

If the aims of education in the arts are appreciation and sensitivity, then these goals defy objectivization, for they are personal states that arise from the creative aspect of the tacit act. They are "emergent" qualities and, as such, are not amenable to specification by the operational principles of the lower level of experience from which they emerge. In other words, behavioral accounts of, for example, music sensitivity in terms of competencies will never adequately reflect the quality of such sensitivity, which is the aim of music education. Educators should, instead, focus their methods on building up the tacit base from which this quality of experience emerges. As Conklin and Reese suggest, periods of study (to enhance focal awareness of content) should be followed by periods of integration (to enhance subsidiary awareness of content). (Such a method would also reflect Polanyi's theory of learning as a two-stage process--composed of irreversible and reversible stages--that we saw in chapter 3.)
Polanyi's philosophy also shows us that the field of the sciences should be subject to the same considerations as the field of the arts. However, as stated previously, science has not generally been handed a problem in terms of "objectives" and "competencies", as the arts have. This is because we live in a society that endorses the scientific world view. Thus, the method of teaching by behavioral objectives fits right into the "objectivist" framework most of us hold in our minds, and some of us hold in our hearts. However, in the words of R.J. Brownhill, Polanyi's analysis is concerned with an attempt to show that the scientific community, far from being different to other communities in that it progresses under the control of impersonal tests, as some philosophers have argued, progresses in the same way. Its only difference lies in its attempt to formulate much more formal criteria of acceptability than other communities concerned with scholarship. (Brownhill, 1973, p. 303)

Nevertheless, as long as science deals with a natural world of physics and chemistry, "objectivization" is legitimate. (Again, this is based on Polanyi's principle of emergence.) However, once we go beyond physics and chemistry to a higher level in the study of living
organisms, as we do in biology or psychology, then Polanyi's philosophy tells us to beware. If a biological organism's strivings are to be seen merely in the light of physico-chemical combinations and reactions, then incongruencies and indeterminacies will surface, and legitimate forms of experience may be invalidated. Thus, the teaching of all science, whether it concerns living or non-living subject matter, but especially where it concerns the study of living organisms, must also leave room for a consideration of the tacit, and of how factors of judgment, intuition, and belief guide all science and are parts of all knowledge.
Chapter 7: The Role of the Learner & The Role of the Teacher

Introduction: Knowledge, Culture, and Intellectual Development. Polanyi's conception of knowledge extends into the ontological domain by virtue of his concept of the tacit, a concept that shows the nature of knowledge, and how man acquires knowledge, verifies it, and holds it to be true.

Polanyi was a scientist-philosopher who accredited the scientific method, yet it is quite clear that he wished to elaborate on the nature of the goal of scientific pursuit and modify it. In chapter 1, we saw how Polanyi's view of this goal contrasted with the view of science in general, especially through his conception of objectivity and of rationality. The contrast between Polanyi's view of the goal of scientific pursuit and the view of objectivist science can be summed up as follows: although the pursuit of science is, in general, the relation of man to the external world, to Polanyi, the pursuit of science is the relation of the mind of man to the external world. Consequently, Polanyi's philosophy does not say that there can be no science without man, but, more specifically, that there can be no science without the mind of man. For science to Polanyi is basically a cultural value and a system of beliefs, as well as a system of methods and a body of
facts—and values and beliefs are functions of mind.

Polanyi makes it clear however, as we have seen in chapter 3, that any intellectual powers that man possesses are rooted in the same prearticulate mental capacities he shares with animals. The development of these capacities into powers is due to man's assimilation of an articulate framework: language and its organized bodies of thought that are generated from, and that are sustained by language. By assimilating these bodies of thought, man assimilates principles, or ways of structuring experience that provide frameworks or contexts for ordering experience and thereby understanding it. Thus, man's intellectual power is not language, but is largely due to language. In other words, man's intellectual power remains tacit.

Tacit Knowledge and Culture. As strange as it may seem, much support for the concept of tacit knowledge and the way this knowledge is transmitted through culture and tradition can be taken from research in the field of artificial intelligence, or AI. For example, attempts to develop computer programs that model human intelligence have shown that language does not only encode vocabulary and words, but also contains the key to a whole body of "common-sense" knowledge—a massive expertise about the world in general—as well as a whole body of shared beliefs
and values that can only be acquired through socialisation. Thus, although language is the key to a vast body of common-sense knowledge, views and beliefs, certain types of knowledge conveyed by language are arrived at not only from meanings gleaned from within the context of its rules and vocabulary, but as the result of shared human experience. In other words, common-sense knowledge is passed on through human, person-to-person communication. (Waldrop, 1984, p. 374)

According to AI researcher Waldrop, the tremendous impact of the function of common-sense knowledge in everyday thought seems to have given a special significance to the phrase that "knowledge is power", and all as a result of AI research by the mid 70's. Waldrop claims that humans do not always think in rigidly logical manners, but often use non-standard logic in reasoning. In other words, he says, people "know" and "believe". He gives the example of how many human experts often look at a problem and see it as a whole. They use less reasoning than recognition, except in unfamiliar situations. Waldrop claims that standard logic also ignores man's ability to retract a conclusion on further examination. (Waldrop, 1984, p. 1280)

Artificial intelligence studies thus suggest that man reasons with judgment, not only with calculation (a conclusion
also reached by computer philosopher J. Wičzenbaum), and
that the basis of this judgment can be found in the meanings
derived from knowledge contexts that are passed on through
culture. These knowledge contexts are a-critical, for
they are based on a system of shared values and beliefs.
Thus, the ideas and conclusions arrived at by AI research
regarding common-sense knowledge bear a striking resemblance
to Polanyi's concepts, yet no mention of the word "tacit"
is ever made. (By pointing out this similarity, I do not
in any way mean to imply that Polanyi's underlying philosophy
bears any resemblance whatsoever to AI philosophy. I only
wish to point out how AI research into language and its
relation to thought supports Polanyi's philosophy of the
tacit.)

What Polanyi's philosophy tells us about the role of
culture in relation to intellectual power is that culture
releases and refines the tacit potentials that are present
only as capacities or faculties at birth. The assimilation
of culture (through language and upbringing) and bodies of
thought in formal education (our articulate intellectual
heritage) affords the mind interpretive tools that give
the mind its power. By means of these tools, the tacit
faculties are able to extend themselves ever further into
their heuristic probings of the unknown through the process
of indwelling.

By the donning of culture, man develops his mental powers by progressing along intellectual pathways that have both personal (commitment to universal standards), and interpersonal (Polanyi's concept of conviviality) checkpoints all along the way. As we have also seen in chapter 1, it is by virtue of these private and public checkpoints that we are able to "trust" that our knowledge is objective, rather than subjective or idiosyncratic. A most fitting statement concerning the understanding of the relation between thought and knowledge is that one must not forget that "human beings have a history of experiences" (Rosenthal & Wiezenbaum, 1983, p. 15).

This chapter will now discuss the implications of the relationship between tacit knowledge, culture, and trust, as manifested in the roles of learner and teacher respectively.

The Role of the Learner. The first implication that can be drawn from the preceding concerns the role of the learner, or student. A large part of the "truth" of what is learned is taken for granted, especially in the initial stages of learning, where the subject matter is less complex and the relationships are more in evidence. However, as the complexity of the subject matter increases, the mind will inevitably be taken along pathways that will often be
characterized by obscurity and bifurcation. This is due to the presence of logical gaps or schisms that can only be forged through tacit, a-critical operations of mind. Thus, in order to proceed along a pathway of mental development, certain mental conditions must be present in the student: (1) effort, and (2) trust.

As we have seen in chapter 3, effort is based on the "active principle", and on an innate urge to satisfy (appetitive and) intellectual strivings that compel all (animals and) people towards intellectual control of their surroundings. At articulate levels of intellectual life, intellectual strivings are manifested as intellectual passions that demand ever richer sources of mental satisfaction. The point remains, however, that no logical gap can be crossed without effort on the part of the student, regardless of the source of mental satisfaction.

One cannot cross a logical gap without a tool or framework (chapter 2) that will extend the tacit by orienting it and casting it across that gap. According to Polanyi's philosophy, the student cannot use a framework as a tool unless he first dwells within that framework, which implies the acceptance and application of the standards of this framework. This requires an initial attitude of trust on the part of the learner. At higher levels of intellectual
development, this trust is translated into decisions to accept competent authorities and traditions for the interpersonal, tacit knowledge that they embody. It is only by crossing logical gaps that the learner is in a position to evaluate what has been learned, for only then is he able to know what is at stake by virtue of his new position. (Crossing logical gaps is somewhat similar to R.S. Peters' idea of "getting on the inside of knowledge".)

The Role of the Teacher: Teacher & Tradition. A second implication that can be drawn from Polanyi's view of the relation between culture, knowledge, and the mental life of man is based on his concept of tacit knowledge, and concerns the role of the teacher.

Polanyi's philosophy tells us that bodies of knowledge are actually made up of more than knowledge that can be stated explicitly. If we take the example of medicine, we can see that medical knowledge is not only composed of anatomical studies, surgical procedures, diagnostic procedures, and procedures for bedside manners. Medical knowledge also contains a large body of what Polanyi calls tacit knowledge, which cannot be found in textbooks or theory, but can only be discovered in the actual practice of medicine. This is because tacit knowledge lives in people and is passed on by people. Consequently, the long periods of internship
that doctors undergo as part of their training enable them to pick up this tacit knowledge. The period of internship in medicine is similar in principle to apprenticeship in the learning of a trade, or to practice teaching, whereby the assumption is that not all that is to be learned as part of a profession can be picked up in textbooks. In Polanyi's view, this essential but unspecified knowledge within a profession can be picked up without conscious awareness through different processes that are rooted in practice and experience. Examples of such processes would be imitation and modeling.

This, however, is only part of Polanyi's story of the "tacit" in knowledge, and does not explain why tradition is so important as the embodiment of tacit knowledge.
Tradition is important because it represents the evolution of truth. It is, as Brownhill says, the "interpersonal" counterpart of the "personal" in tacit knowledge.

The embodiment of tacit knowledge in persons and in traditions implies a two-fold obligation on the part of educationists: (a) education must provide opportunities for the passing on of "personal" tacit knowledge through person to person contact—for example, internship and apprenticeship—in accordance with the level of intellectual development of the student, or the amount of tacit knowledge
present in a particular body of knowledge; and (b) education must also ensure the passing on of "interpersonal" tacit knowledge through the untampered-with dissemination of current accepted theory in the traditional bodies of knowledge, especially at the elementary and secondary levels of schooling, and most importantly, at the elementary level where minds are most impressionable.

This is not to say that there is or should be no controversy concerning these traditions (a case in point is the example of science itself and Polanyi's refutation of its completely objectivist ideals). It is nevertheless quite clear in Polanyi's philosophy that change in the interpersonal aspect of tacit knowledge (which implies the evolution of truth) should be effected by the practitioners and/or mechanisms that are in operation within the disciplines themselves (for example, personal responsibility and conviviality). Polanyi was himself a model for such a method of change, for, as we have seen, he was a scientist who sought to modify the ideal of a totally objective knowledge from within the discipline of science by expansion of the concept of "objective".

An implication concerning the role of the teacher can be drawn from point (b) of the preceding. The teacher's role is to pass on bodies of knowledge in a manner that
respects their integrity. The classroom, and most importantly, the students' minds, should not be the forum for a teacher's subjective or idiosyncratic opinions that cannot be backed up by corroborative writings or evidence that is respected within the community of scholars, and that is generated from within that discipline. In cases where specific controversies represent legitimate, unresolved issues within the discipline itself, care should be taken to expose these debates at a point in the student's intellectual development when he would be able to grasp the significance of the underlying assumptions and conflicting values, probably at the senior high school level and beyond.

The underlying value and assumption concerning the preceding is that every student has the right to the tacit, interpersonal knowledge that represents the evolution of truth, and that is embedded within traditional bodies of knowledge. Access to knowledge of the evolution of truth is antithesis to indoctrination, and is the only effective remedy against it. (It is important to note that, as stated at the beginning of chapter 1, one must first accept Polanyi's assumption of the inherently rational nature of reality, in order to accept his view that true or objective knowledge represents the evolution of truth.)

Agassi points out how Polanyi himself, as a professor
of physical chemistry, did not teach his unique but idiosyncratic theory to his students because of his (Polanyi's) acceptance of the authority of the then current scientific opinion. (Polanyi's "revolutionary" theory had not yet been accepted by the scientific community, and was only subsequently accepted as the subject of his Ph.D. thesis by--according to Polanyi himself--"luck".) (Agassi, 1975, p. 154)

Polanyi nevertheless regarded the authority of a community of scholars as indispensable to the discipline of that community, serving an invaluable, though sometimes "menacing" function in scientific progress. Agassi goes on to say that although Polanyi supported enlightened censorship within the scientific community, he did, at the same time, respect the "rebellion" of genius--but only those men of genius who could be worshipped "post hoc". This idea of genius, Agassi claims, is enriched by Kuhn's idea of paradigm change, whereby authority itself is maintained even when opinions change. (Agassi, 1975, pp. 154-155)

Agassi rejects Polanyi's "central authority" model of the scientific community and its consequent elitist view of scientific genius: genius, in order to be recognized as such, must be recognized within the scientific community.
Agassi claims that this view of genius is contrary to what is valuable in science, and that "unless scientific results get regularly vulgarized, the mediaeval picture he (Polanyi) presents of science--with masters, apprentices and unarticulated personal knowledge and mystique--might come true and plunge us into a new Middle Ages" (Agassi, 1975, p. 159). Agassi claims that "trusting the expert is . . . quite undemocratic and anti-autonomous" (1975, p. 160).

In Agassi's rejection of Polanyi's view of the central authority of the scientific community, however, it must be noted that he makes no mention of Polanyi's view of self-set or autonomously-set standards and ideals of the individual members within the scientific community, nor of the universal standards that are recognized and appreciated by all members. To use R.S. Peters' phrase again, Polanyi's idea of self-set standards would be similar to the type of caring that comes from being "on the inside of knowledge".

These universal standards constitute Polanyi's safeguards against scientific anarchy, thus ensuring progress while at the same time ensuring that the pursuit of knowledge is, to the best of man's ability, a pursuit towards the evolution of man's knowledge of truth. There is no mistaking the purpose of scientific pursuit throughout Polanyi's philosophy in its reference to truth—and this is the part
of Polanyi's philosophy that can be considered mystical and unorthodox.

Furthermore, although Polanyi advocates the authority of the scientific community, what he really means by this authority is the authority of reason as it is embodied within the tradition of science (or any other body of knowledge), for it is only within a tradition that the interpersonal, tacit knowledge of scientific rationality can be preserved and passed on—and it is this knowledge that to Polanyi is the fertile ground for scientific genius.

Going back to Agassi's criticism that Polanyi holds an elitist view of scientific genius, I find it important to point out that Polanyi's view of the authority of scientific opinion within the community of science actually represents one of his very orthodox scientific views within an otherwise rather unorthodox total philosophy, based, as it is, on an assumption of rationality in nature. Thus, to attack Polanyi on this point (elitist view of genius) seems to miss the point, for instead of attacking Polanyi, it attacks the whole orthodox scientific community, rather than the point that represents the really unorthodox part of Polanyi's philosophy.

The Role of the Teacher: The Teacher & The Learner.

What more can be said of the role of the teacher if we take
into account the role of the learner (effort and trust),
and the nature of tacit knowledge (personal and interpersonal)?

At the elementary or primary level, the teacher's role
would be to enhance the natural curiosity or effort and
trust of the student. This would largely be accomplished
by creating an atmosphere of discipline, respect, and caring
in the classroom, and by encouraging and motivating the
student through interesting and varied activities that are
suited to the student's developmental age and ability.
(Curriculum and methods have already been discussed.)

The general goal of the teacher at the elementary level
would be to enhance the student's feeling that school is a
place where intellectual tasks are stimulating and satisfying.
As the student embarks on his mental life, the conditions
of effort and trust that are pre-requisite to, as well as
correlates of a satisfying intellectual experience would
thereby be assured.

As a corollary to the preceding, it would also be
part of a teacher's role to be aware of impediments to
natural trust and interest if he finds them to be lacking
in the student, in an effort to help the student by attending to
such impediments. The importance of enhancing trust (which
stems from the natural tendency to accept the conditions
that one is born into), and of enhancing effort and interest
(which stem from the active principle and the urge to gain intellectual control over one's experiences) cannot be understated. However, Polanyi's philosophy implies that trust and effort are natural inclinations in human beings, where impediments to trust and effort pose threats to a natural state.

The obligations of the teacher's role regarding the emotional and intellectual welfare of his students is expressed by R.S. Peters, and, based on Polanyi's view of the necessity of the natural states of effort and trust as pre-requisites to learning, I would imagine that Polanyi would concur with such an expression of teacher obligation:

If the need to love and to be loved is not satisfied... attempts to learn things will also be hampered by his lack of trust and confidence. The teacher himself must obviously be an exemplar in this respect if he is to do his job effectively... what is required of him is not an intense liking for his pupils but a respect for them as persons... the awareness that one is confronted with developing centres of consciousness. The teacher must be unswerving in his allegiance to the principles which mark out his "holy ground". But, especially in the early stages of initiation,
he must not be brutal in applying them to the halting or misdirected ventures of his pupils. . . . To take a hatchet to a pupil's contribution, before he has much equipment to defend it, is not only likely to arrest or warp his growth in this form of thought; it is also to be insensitive to him as a person. When Socrates described himself as a midwife in the service of truth he used a brilliant image to illustrate this dual aspect of a teacher's concern . . . . Both forms of concern are obligatory. (Peters, 1966, pp. 58-59)

At the secondary level, the role of the teacher would be that of a specialist in the development or evolution of thought or truth within the discipline that he is teaching. For example, if he is teaching literature, he would show how literature, as a body of knowledge, constitutes a way of interpreting experience, and as part of a traditional body of knowledge, how it is also a representation of an aspect of reality. This would reflect Polanyi's view of reality, truth, and tradition. The teacher would tie literary achievements to historical events, thereby giving these achievements a social setting. Inventions or discoveries that may have influenced the character of literary achievement
would also be discussed, as would be the relationship of the different arts to literature—*a reflection of Polanyi’s view that invention and discovery rest on the shoulders of culture, which generates and sustains these processes (chapter 2). In this way, facts would come alive, and connecting links would be made between historical settings and intellectual achievements.

The secondary level teacher would also deal with the particulars of literary works—*the symbolic use of language, the visual and imaginative power of descriptive portrayals, the literary techniques employed, the technical merit of the work. This would reflect Polanyi’s "complementary" view of the personal nature of genius (complementary to its interpersonal, cultural nature just described above).

The overriding goal at the secondary level would be to illustrate to the student both the complexity and depth, as well as the basic unity of human achievement. The purpose would be to channel efforts towards ever higher levels of intellectual passions, prodded on by intimations of beauty, joy, and excellence—*new and more permanent sources of intellectual satisfaction. This would be in line with Polanyi’s view of the development of intellectual life, and its sources of mental stimulation and satisfaction (chapter 3).

The newly-developed passionate component of thought
would be enhanced in order to evoke "correct" modes of feeling in the student by calling attention to the intellectual qualities that are a token of reality (such as beauty and harmony), and by calling attention to the value of literature as a representation of that reality. This would reflect Polanyi's ultimate view of the inseparability of fact and value, and of his view that man is the embodiment of values (chapters 1, 5).

At the post-secondary school level, the teacher would ideally be a master of the discipline he is teaching. For example, a course on abnormal psychology would be taught by a clinical psychologist or psychiatrist; a literature course would be taught by a literary critic; a physics course would be taught by a physicist. He would also be an active member of the academic community he is part of through writings, research papers, conferences to keep abreast of current trends, and periodic sabbaticals for further study in his field of expertise. This would reflect Polanyi's view of the nature and functioning of tacit interpersonal knowledge (chapter 2).

The post-secondary level teacher would embody his discipline through his theoretical perspective, and be a connoisseur in the application of this perspective to problems and solutions within his field. Above all, he
would be intellectually and emotionally loyal to his discipline. This would reflect Polanyi's idea of caring about standards and ideals, both self-set and universal.

The role of the post-secondary level teacher would be to entice the maximum development of students' intellectual passions by the means and mark of his theoretical precision. The overriding goal would be that the student be awakened to a particular value that transcends experience through meaning and perspective, and yet, that can only be apprehended from within a particular medium, and appreciated within a particular form or body of knowledge that transcends experience. This, I believe, would reflect the depth of Polanyi's views regarding the nature and purpose of knowledge in its relation to truth and experience. Polanyi ultimately believes in a rational power of man that is capable of transcending the world of experience—allowing him to break through its limits, elevating him into a richer world of meaning that is larger than experience because, although it is rooted in experience, it is not bound by it.
Chapter 8: Education and Forms of Knowledge

This chapter will consist of two sections. Section 1 will discuss tacit knowledge in relation to "forms of knowledge", and section 2 will discuss tacit knowledge in relation to P.H. Phenix's "realms of meaning".

(1) Forms of Knowledge. Our conception of education is almost totally immersed in our conception of knowledge. Thus, what we think about knowledge is most important to what we do in education.

Although one may talk about the general aims of education as being either the development of intellect or character, or training in occupational skills, or the pursuit of worthwhile activities, and although one may organize one's educational day accordingly without, in some cases, ever mentioning the word "knowledge", the truth is that our conception of knowledge is "tacitly" at work in all our goings-on. Of course we always knew this. Polanyi's great contribution to what was happening, however, is that he formally acknowledged what was going on by giving it a name, a structure, and a function and thus, a new and respected status. Now, all kinds of things can be going on in education (as they always were), and we can now talk about them (as we always did), but in different ways. This is the power of "new" concepts as
they are applied in "old" fields.

An example of the power of the new concept of "tacit knowledge" in the field of education can be found in a recent article in the magazine "Educational Leadership". The authors use Polanyi's concept of tacit knowledge as a theoretical basis in their development of a type of "practical intelligence" training program for students. The point that the authors are making is that a certain amount and type of "practical" knowledge on the part of the student is prerequisite to ensuring his educational success. This necessary prerequisite knowledge forms the basis of the authors' specially-developed program of "survival skills" that are taught to students: skills such as how to manage oneself, how to manage tasks, and how to work with (or manage) others. (Sternberg, 1990, pp.35-39)

It is clear that tacit knowledge is here being equated with practical knowledge. Furthermore, the necessary, prerequisite practical knowledge students must have is often synonymous with the implicit expectations and assumptions of teachers. For example, if a teacher asks students to write a book report, he/she may be assuming that the students know how to complete such a task. If the objective of the task is the actual book report production, and the student is being evaluated on the
quality of his grammar and ideas, then the prerequisite knowledge of how to go about the task may not even enter into the evaluation. If he does not know how to write a book report and so can't get himself organized because he doesn't know where to begin, then the student may be losing valuable time he could be using towards the development of his ideas. The teacher's assumption that the student knew how to write a book report would not even enter into the evaluation of the student's success or failure.

The preceding example of the application of a new concept in an old field is meant to show that it is now possible for educationists to talk about the implicit expectations and assumptions of teachers in relation to students' having or lacking tacit knowledge, due to the introduction of Polanyi's concept of tacit into the field of education.

Although new terms give new meanings to old practices and thus allow for new solutions to emerge, as can be seen in the example, there is also a danger that the true richness and complexity of the new concept will be lost. The application of Polanyi's concept of tacit as depicted in the preceding example represents a very narrow, and perhaps too narrow view of all that Polanyi means by "tacit".
If "tacit" becomes conceptually identified with "practical", then (a) our understanding of what Polanyi means when he says that tacit knowledge is a form of knowledge (which he does), combined with (b) a growing hunch that important considerations regarding knowledge have been neglected in our traditional conception of knowledge (J. Soltis, J. Martin), may lead us to (c) alter our original conception of "forms of knowledge" in ways that are not indicated by the new term itself (tacit), but by our application of it (tacit = practical). Both our original conception and the new term become impoverished as a result.

The implication that tacit knowledge, or knowing how, may be considered as a "form" of knowledge has been expressed by J. Soltis:

Knowledge is not just what is contained in heads and books but also in hands and actions as we take part in social living . . . .
A sociocentric perspective invites our attention to those forms of human knowledge imbedded in human activities that embody the techniques and institutions we have developed . . . .
Knowing how to do something and how things are done are every bit as important as forms of knowledge as is knowing that something is
true or false. (Soltis, 1981, p. 103)

Furthermore, Soltis seems to be using the term "form" in the same sense as that implied in P.H. Hirst's view of the distinctive "forms" of human knowledge (e.g., math, physical science, knowledge of persons, of literature, of fine arts, morals, religion, and philosophy), for Soltis goes on to say that Hirst's view of knowledge is too narrow as it omits a concern for skills, attitudes, and emotions (Soltis, 1982, pp. 105-106). The forms of knowledge are, according to Soltis, organized fields of study and inquiry that represent the organized efforts of collections of human beings through time to "bring order to the several realms of human experience" (Soltis, 1982, p. 104). However, although Polanyi did himself identify "tacit" as a "form" of knowledge (he said there were two--tacit and explicit), he did not mean that tacit knowledge is a form of knowledge in Hirst's and Peters' sense of "form".

What Peters and Hirst mean by "forms of knowledge" is what Polanyi means by "explicit" knowledge and its development into organized bodies of public knowledge--for example, science. Tacit knowledge is not a separate form of knowledge in the sense in which science is a separate or distinct form of knowledge, different from
art, history, or religion. Polanyi would argue that there is a tacit or practical component in every body of formal or explicit knowledge—not that there is a distinctively separate form of knowledge called tacit, equivalent in meaning and form to art or science as an organized body. The idea of tacit as separate and distinct from formal and explicit is precisely the idea that Polanyi's whole philosophy sought to challenge.

Polanyi's total philosophy indicates that he identified two separate forms of knowledge (tacit and explicit) in order to conceptually distinguish their different structures and functions. The ultimate purpose of this distinction, however, was to see more clearly the relationship between the two—that is, how the explicit rests on and is shaped by its tacit component. As has been seen in chapter 3, one of Polanyi's main contentions is that the tacit continuously operates in the relationship between thought and language, and consequently, in the articulated domains of explicit knowledge. Polanyi's distinction between tacit and explicit as two forms of knowledge is thus a distinction based on function. In the next section of this chapter, we will see that traditional forms of knowledge are distinctions based on meaning, rather than on function.
Thus, although Polanyi's concepts can be related to the forms of knowledge concept, it is not by identifying "tacit" as another "form" of knowledge that the full meaning of tacit can be captured. Rather, it is by relating Polanyi's concepts to the forms of knowledge concept in terms of: (a) the role of culture in the development of knowledge (chapter 3); (b) the development of a conceptual framework (chapter 2); (c) the process of discovery (chapters 1-2); and (d) the cultural valuation of formal knowledge (chapter 3). Since these Polanyian themes have already been discussed throughout the first part of this paper, I will at this point only relate the themes to education by showing how they complement R.S. Peters' view of education as the process of initiation into the public bodies, or traditional forms of knowledge.

Polanyi, Peters, and Knowledge. Peters claims that education is a process of initiation into the "public traditions enshrined in language" (1966, p. 49)—the idea being that (a) the ideas contained therein do not develop out of individual, but rather, out of "collective" experience (akin to Polanyi's concept of the role of culture in knowledge), and that (b) conceptual differentiation develops as one:
... opens the gates to a vast inheritance accumulated by those versed in more specific modes of thought and awareness such as science, history, mathematics, religious and aesthetic awareness, together with moral, prudential and technical forms of thought and action ...

Each of these differentiated modes of thought and awareness is characterized both by a content or body of knowledge and by public procedures by means of which this content has been accumulated, criticized, and revised. Each has its own family of concepts peculiar to it and its own distinctive methods of validation. (Peters, 1966, pp. 50-51)

The preceding is akin to Polanyi's notion that the shaping of knowledge is really the shaping of a conception.

Peters goes on to say that:

... many do little more than develop a familiarity with such a mode of thought together with a mastery of some portion of its body of knowledge. A few, however, develop this form of thought themselves to a pre-eminent degree and contribute themselves to the criticism and development of its content. But for all who
get on the inside of such a form of thought and who make it, to a certain extent their own, the contours of the public world are to that extent transformed. (Peters, 1966, pp. 50-51)

The preceding is akin to Polanyi's conception of the process of discovery, and the process of knowing, whereby knowing is an individual act of discovery and yet, although it is an individual act, the knower's act contributes to the cultural valuation of science as a body of knowledge by virtue of his appreciation of it.

In summary, Polanyi's philosophy seems to highly endorse the traditional "forms of knowledge" conception of knowledge, especially in relation to the aims of education as described by R.S. Peters. Furthermore, although Polanyi's concept of "tacit" can be taken to mean "practical" (and rightly so), this is not the richest source of meaning of the tacit concept that can be found in his philosophy.

By focussing on this narrower meaning of tacit in educational practices, educationists risk neglecting a very potent source of meaning in Polanyi's philosophy that points to the endorsement of traditional and liberal values, aims, and methods in education. This is in contrast to the cultivation of a practical "how to" type of knowledge and approach to learning that is equally
implied, though not fully justified when we consider the scope of Polanyi's philosophy. Furthermore, the narrower sense of "tacit" may actually militate against the far richer implications of Polanyi's philosophy (see Broud's "uses of schooling" discussed in chapter 4 as an example of the richer implications of Polanyi's thought).

(2) Realms of Meaning and Forms of Knowledge. In his book "Realms of Meaning", Philip H. Phenix develops a theory of the curriculum based on a philosophy of man and of knowledge. The basic argument of his philosophy concerning man is that people have the power to experience meanings (1964, p. 5), that human nature is rooted in meaning, and that human life is directed towards the fulfilment of meaning (1964, pp. x-xi).

Phenix's basic premise concerning knowledge is that knowledge represents a comprehensive pattern. The various disciplines are the constituent elements within this comprehensive pattern of knowledge--they are structures that represent the varieties, or realms of meaning (1964, p. 4).

In his analysis of the realms of meaning (six are identified), Phenix shows that no single quality can represent the essence of meaning. Because meanings are of many kinds, he says, the full development of human
beings requires education in a variety of realms of meaning, rather than in a single type of rationality (1964, pp. x-xi). General education is the process of engendering essential meanings (1964, p. 5), and an integrated outlook (1964, p. 4).

Although Phenix advocates a return to the traditional subject matter curriculum, he makes it clear that the purpose is not necessarily for the training of mind and character, but "as a means of making the most economical use of each person's capacity for learning" (1964, p. x). This economy is based on the fact that the realms of meaning are found in their most refined forms within the traditional disciplines.

Analysis shows that the meanings by which human nature is defined are conscious experiences with structural principles, some of which prove capable of elaboration as cultural traditions with correspondingly symbolic expressions. These traditions of significant meaning may be found in the most refined and articulate form in the various scholarly disciplines. For purposes of education these disciplines may be assigned to six basic logical classes, or realms of meaning, indicating the general kinds of understanding a person must have if
he is to function well within the civilized community. (Phenix, 1964, p. 29)

Each discipline is thus part of an overall logical pattern and is characterized by a particular outlook, style of thinking, and organization of ideas that has been developed by experts in the course of inquiries in the areas of their competence (1964, p. 53). The organizing concepts, structures, and methods of these disciplines can be used as guides in the selection of materials so that what is taught may be as meaningful as possible (1964, p. 56).

The six fundamental patterns of meaning that Phenix identifies are the following: symbolics, empirics, esthetics, synoetics, ethics, and synoptics. Each different pattern of meaning refers to different types of meaning that are mediated by different modes of understanding. (1) Symbolics is the most fundamental realm and must be used to express meanings in all other realms. It includes ordinary language, math, and the various types of non-discursive symbolic forms, such as ritual. (2) Empirics includes the sciences of the physical world, living things, and man. Meanings in this realm are expressed as probable empirical truth. (3) Esthetics includes the various arts such as music, the visual arts, arts of movement, and literature. The meanings
are concerned with the contemplative perception of particular things as "unique objectifications of ideated subjectivities". (4) Synoetics, says Phenix, embraces what Polanyi calls personal knowledge. This realm signifies relational insight or direct awareness. It is analogous in the sphere of knowing to sympathy in the sphere of feeling. Personal or relational knowledge is concrete, direct, and existential. (5) Ethics includes moral meanings that express obligation rather than fact (as empirics), or perceptual form (as esthetics), or awareness of relation (as synoetics). Morality has to do with personal conduct based on free, responsible, and deliberate decision.

(6) Synoptics has to do with meanings that are comprehensively integrative. It includes history, religion, and philosophy—all disciplines which combine empirical, esthetic, and synoetic meanings into coherent wholes. Symbolics (the first realm) encompasses the whole range of meanings because they are the necessary means of expressing all meanings, whereas synoptics (the sixth realm) encompasses the entire range of meanings also, but by virtue of its integrative character. (1964, pp. 6, 7, 8, 29)

The six realms are the foundations for all meanings that enter human experience, in the sense that they are the "pure and archetypal kinds of meaning that determine
the quality of every humanly significant experience" (Phenix, 1964, p. 8). From this viewpoint:

Any particular meaning can be analyzed as an expression of one of the fundamental meanings or as a combination of two or more of them . . . . If the six realms cover the range of possible meanings, they may be regarded as comprising the basic competences that general education should develop in every person. A complete person should be skilled in the use of speech, symbol, and gesture, factually well informed, capable of creating and appreciating objects of esthetic significance, endowed with a rich and disciplined life in relation to self and others, able to make wise decisions and to judge between right and wrong, and possessed of an integral outlook. These are the aims of general education for the development of whole persons. A curriculum developing the above basic competences is designed to satisfy the essential human need for meaning.

(Phenix, 1964, p. 8)

Within the six realms of meaning, claims Phenix, realms four (synoetics, which Phenix equates with Polanyi's personal knowledge) and five (ethics) present some difficulty.
So unfamiliar is the domain of personal knowledge within the prevailing system that a new term, "synoeitics", seemed required to represent it. Furthermore, the synoeletic realm is not constituted by a set of standard academic disciplines, corresponding to the constituents of the symbolic, empirical, esthetic and synoptic realms. Instead, the exposition of synoeitics required the use of an assorted selection of movements growing up within disciplines belonging to other realms, chiefly psychology, literature, religion, and philosophy. (Phenix, 1964, p. 187)

A similar situation is found in the ethical realm, according to Phenix.

Among all the realms, the two dealing with personal and moral knowledge are at one and the same time the most essential because they deal with elemental human meanings that sustain all other knowledge. (1964, p. 188)

The problem of realms four and five are that personal understanding and moral judgments are not in any definable sense "knowledge" (Phenix, 1964, p. 188). Perhaps, says Phenix,

If they do not seem to qualify as knowledge, it
may be that the criteria of what counts as knowledge need to be broadened and more precise distinctions among the varieties of knowledge need to be made. . . . the reason these two kinds of knowledge do not appear to fit neatly into the structure may not be due to any deficiency in them, but to the one-sidedness of the academic world. (1964, p. 189)

Thus, Phenix wishes to avoid construing knowledge in purely intellectualistic terms, just as Polanyi sought to do. Furthermore, Phenix's idea of the justification of such "other" knowledge is also similar to Polanyi's, for he claims that expert understanding in these realms can be defended by reference to the great seers and prophets of mankind and to certain movements within professional scholarship itself (1964, p. 189). This justification corresponds to Polanyi's idea of the intellectual and cultural feats of the pioneering minds of our ancestors, and of their effect on the orientation of explicit knowledge, or its direction of growth.

Perhaps the structures of the realms of meaning that are concerned with personal being, such as understanding and judgment, elude attempts to be classified as distinctive forms of knowledge because they are not. As argued in
the first section of this chapter on "forms of knowledge", Polanyi's work seems to suggest that personal knowledge (Phenix's realm of synoetics) and judgment (Phenix's realm of ethics) are not separate forms of knowledge, but are components of all knowledge—components that are manifested as orientation or direction in the development or growth of knowledge in its relation to truth. Synoetics and ethics, however, may help answer the question of why and how separate realms of meaning represent the progression of undifferentiated "knowledge" into refined, articulated, and distinctive modes of thought that are represented by the various disciplines.
Chapter 9: Educational Evaluation & Behavioral Objectives

As seen in chapter 6, Polanyi's philosophy suggests that "knowing" is an achievement term that means "understanding", "grasping meaning", and "valuing". These types of outcomes seem to be more qualitative than quantitative, in the sense that evaluation of such outcomes would imply looking at modes of achievement that cannot always be accurately or easily measured by quantitative methods. Yet, educational evaluation is usually taken to mean measurement and testing, even though measurement is only one part of evaluation, and testing is only one form of measurement (Cryan, 1986, p. 374).

Testing and evaluation have thus almost become synonymous terms. This has partly to do with the way the history of evaluation has evolved alongside the history of educational accountability. For example, in the late 1960's and early 1970's, a stepped-up demand for accountability led to a stepped-up demand for formal educational evaluation. Consequently, says Talmage, curriculum development and evaluation became partners, since evaluation had to lend legitimacy to the curriculum (1985, p. 1). Instructional objectives came to be viewed as standards by which to measure achievement. In this way, curriculum came to be shaped by what tests could measure, and the primary vehicle of evaluation became testing (Cryan, 1986, p. 349).
Although testing and the quantitative approach led to different types of evaluation models (for example, the goal-attainment model, or the decision-facilitating model), the application of instructional objectives to evaluation remained central within all types of models.

Major evaluation projects of today are rooted in Ralph W. Tyler's conception of educational evaluation (Popham, 1975, p. 23). His approach involved the careful formulation of educational goals according to an analysis of three goal sources (student, society, and subject matter), and two goal screens (a psychology of learning and a philosophy of education). The resulting goals are transformed into measurable behavioral objectives.

There are two limitations involved in using this type of quantitative, behavioral objective approach in evaluation in light of Polanyi's philosophy of "knowing".

First of all, if curriculum is shaped by what tests can measure, then forms of knowing and performance that are difficult to test will be omitted. This is because behavior and knowledge that cannot be reliably tested will be dropped as criteria. Consequently, this may leave out modes of achievement, such as depth of understanding and refinement of musical perception, that are implied in Polanyi's philosophy (see chapter 6) and concept of knowing.
A focus on only one type of objective that is quantitatively measurable is based on the assumption that because the criterion can be measured, it is more objective, scientific, and hence, value-free (Benz & Newman, 1986, p. 3). However, as Benz and Newman claim, and as we have seen in chapter 5, no focus—not even a scientific one—is "value-free". Thus, the choice to leave out modes of achievement that cannot be measured by testing is not only a value choice, but also, in Talmage's words, constitutes a "myopic" focus (1985, p. 4). A focus on only one type of objectives—a myopic focus—will not reflect the array of student outcomes in education that should also be considered in evaluation.

The second limitation in the behavioral objective approach in evaluation is that, since objectives such as "to understand" or "to appreciate" are evaluated only in terms of defined behaviors, then evaluation can never fully reveal the difference between what a student will do and what he can do—for what he can do is specified beforehand. Behaviorally defining objectives means that the evaluated behavior must fit the parameters of the vocabulary and ideas of the evaluation model being used. Polanyi's philosophy, however, clearly shows that appreciating and understanding are achievement terms and,
as such, cannot be specified beforehand. They are subjective, indeterminate states, based on a subsidiary background of supporting content (chapter 6). By evaluating these states in terms of defined behaviors, they become prescriptive terms, and the whole notion of achievement, that is a major part of Polanyi's concept of knowing, is lost.

In summary, significant modes of achievement and significant modes of meaning are likely to be ignored by the behavioral objective model of evaluation. Furthermore, if educational outcomes are essentially taken to mean the measurement of behavioral changes that are prescribed and consonant with the objectives of the educational program being evaluated, then the parameters of the decision-making basis will be very limited. They will show nothing of the richness of the process of education.

How can we avoid the limitations of behavioral objective evaluation, as we apply the practice of evaluation to the types or modes of achievement and meaning that are central to Polanyi's philosophy? It is quite clear that we would need a new concept of "objectives", and a new evaluation model.

E.W. Eisner has developed an "aesthetic model" as an alternative to the conventional quantitative scientific evaluation models. The parameters of his model are
flexible, and can easily accommodate a philosophy as rich as Polanyi's. In many ways, Eisner's ideas regarding knowing, connoisseurship, the ineffable, and the art of criticism are strikingly similar to Polanyi's ideas of knowing, connoisseurship, the tacit, and the persuasive passions of the discoverer as he presents his discovery to his particular scholarly community.

An example of the similarity of ideas can be seen in the following Eisner quotes:

> Knowing, like teaching, requires the organism to be active and to construct meaningful patterns out of experience. . . . to construct a meaningful world requires that we conceptualize patterns of the environment, recognize the rules that are both tacit and explicit in our social life. (1985, p. 364)

> Practical judgment based on ineffable forms of understanding should not be regarded as irrational. It might reflect the highest forms of human rationality. (1985, p. 365)

Eisner developed his aesthetic model in order to provide a framework for the evaluation of qualitative classroom events that are as important as quantitative measurements in describing and evaluating educational
outcomes.

Because classroom life cannot be explained by behavioral laws, Eisner sees the major contribution of evaluation as that of contributing to a heightened awareness of perception of the qualities of classroom life (1984, p. 452). Eisner's whole model is based on the assumption that what we know is shaped by many intellectual structures that are framed in non-discursive forms of knowledge (similar to Polanyi's idea of the tacit), and that we must therefore use art forms, as well as science forms, to conceptualize, express, and communicate forms of knowledge that science forms cannot capture. Consequently, Eisner's aesthetic model is composed of two dimensions of educational evaluation that are rooted in the arts. These dimensions represent two modes or ways by which we come to know and understand, and how we express what we come to know. The two modes are educational connoisseurship (or the art of appreciation), and educational criticism (or the art of disclosure).

Eisner's concept of connoisseurship is very similar to Polanyi's. According to Eisner, to be a connoisseur is to be able to discriminate subtleties, and to be able to draw on memory, against which the particulars of the present may be placed for comparison and contrast. The connoisseur
appreciates—that is, he is aware of and understands what is experienced. It is the awareness that provides the basis for judgment. (Eisner, 1985, p. 149)

How we attend to things, Eisner says—instrumentally, for classification purposes, or artistically, for reflection—will present the array of qualities and patterns from which meanings can be drawn. When the senses of perception are refined to see what others miss, we gain possibilities to follow. Eisner says that we are imaginative when we can manipulate the images we have encountered in our mind's eye to explore alternatives that cannot be encountered in the empirical world. This seems to be what he means by his term "the educational imagination"—a concept that is very similar to Polanyi's idea of the heuristic probings of the tacit faculties in the processes of discovery and invention.

In order to make the knowledge gained by connoisseurship public, one must articulate, or render those qualities perceived in a language that makes them vivid. (Polanyi's term for this concept involving the disclosure of one's knowledge to the public is "persuasive passions".) The form, then, must be intentionally crafted to disclose the experience, Eisner says, in order to make the private world public. Thus, metaphor, analogy, suggestion, and
implication are the tools that the critic must use in order to imply and suggest. He cannot simply translate, for he is describing experience, and all the qualitative subtleties that experience implies. This discloses a paradox: how can the ineffable be articulated? How can words express what words can never express?

First of all, in order to interpret, the critic must know the meaning of what he sees, which demands empathy, informed use of a variety of social sciences, and the wisdom of experience—that is, he must be an educational connoisseur. The critic uses the poetic language of metaphor or analogy to make the world he has privately perceived public. How objective, then, is this qualitative approach? Is it too "subjective" to be reliable? Eisner argues that criticism is an empirical method, and that the adequacy of the criticism is tested in the work itself. The work of the educational critic will be to direct attention to the subtle, to point out, and to articulate. If what is described cannot be seen, then, Eisner says, the critic has failed in his task as a critic. (1985, p. 149) Eisner's account of the process of the articulation of the ineffable is similar to Polanyi's description of the process by which personal, tacit knowledge becomes accepted into a body of public knowledge; characteristic
of Polanyi's process are two dimensions that were discussed in chapter 3—the relation between thought and speech (or concepts and language), and the heuristic and selective function of intellectual passions.

In summary, Eisner's aesthetic model of educational evaluation takes into account two aspects that are ignored in quantitative behavioral objective approaches: (a) diverse qualitative student outcomes in education, and (b) the tacit ability of teachers (or evaluators) to "read" the meaning of those modes of student achievement and meaning that cannot be expressed in scientific or empirical forms, and their (teachers') ability to reveal these tacitly perceived meanings or achievements publicly, through non-empirical methods.

The preceding aspects or dimensions of educational evaluation are strongly implied in Polanyi's philosophy.
Summary of Educational Implications (Chapters 4-9)

(1) Curriculum. Polanyi tells us that man is different from animals only insofar as he develops his tacit potential for understanding, judging, grasping meaning, and valuing.

In developing its curriculum, liberal education both assumes, and aims to cultivate that which is different in man as compared to animals (Adler). Thus, the underlying philosophy and goals of a liberal curriculum accord with Polanyi's notion of the tacit potential in man.

According to Polanyi, man's tacit potential can only be evoked through the assimilation of language and the cultural and intellectual traditions that have arisen as a result of language.

How a liberal curriculum enhances tacit powers has to do with associative and interpretive uses of schooling and its curriculum (Broudy), rather than its replicative and applicative ones. Through association and interpretation (mental mechanisms by which man assimilates knowledge), subsidiary contexts are built up that act as tacit resources in enabling focal material to be understood. Each discipline has a characteristic structure that is tacitly assimilated as the facts or particulars of the discipline are learned, and it is this structure that remains as a resource for interpreting experience long after the details are
"forgotten". Tacit potentials thus have to do with the elaboration and utilization of contexts in understanding experience.

(2) Educational Decisions. Polanyi's philosophy tells us about the inseparability of fact and value. We are not detached observers of an independent reality whose methods reveal value-neutral facts, but rather, we are active participants in the shaping of conceptions that reveal independent reality—knowledge of which rests on the value-laden presuppositions and assumptions of those conceptions. In other words, facts are tied to the underlying values of their presuppositional, fiduciary framework.

Many educational practices obscure this fact-value relationship, resulting in an overall substitution of the authority of the person for the rational authority of the argument, mainly because we fear indoctrination. However, if we cannot separate fact and value, then we must accept the fact that our decisions represent our projected values. The implication is that we start looking for means of explicating these values and their relation to education, in an effort to rationally justify the values we tacitly endorse. (Examples given were Schwab's "method of deliberation" and J. Burgess's application of value criteria.)
(3) Methods in Education. Polanyi's philosophy says that knowing is both an achievement and an integration. Thus qualities such as meaning, complexity, depth of understanding, harmony, etc., can be understood as characteristics of successful tacit integrations that cannot be explained by lower level organizational principles, for they are emergent qualities that represent the "achievement" aspect of knowing. Although tacit integrations generate these emergent qualities that characterize achievement, they are nevertheless based on a defining ground of relevant content material (subsidiary context).

Two educational implications can be drawn from the dual integration-achievement aspects of tacit knowing. First of all, because knowing is an integration of subsidiaries to focal awareness, the methods in education must present opportunities to integrate subsidiary content. Thus (a) content must be relevant to the desired integration, and (b) the method should include periods of formal study followed by periods of experiences aimed at integrating those studies (Reese, Conklin, Whitehead). Secondly, because knowing is an achievement, some outcomes cannot be accounted for by formulation or specification. This explains: (a) why desired outcomes are not always immediately (or sometimes ever) achieved in education;
and (b) how some desirable states such as appreciation and refined perception are personal and indeterminate outcomes that defy objectivization because they are emergent qualities that cannot be accounted for by lower-level specification.

The implication of both achievement and integration is that educators should focus methods on building up the tacit base from which quality of experience (desired outcome) emerges.

(4) Role of Learner/Teacher. (a) Role of learner: Polanyi's philosophy tells us that language and tradition embody tacit, interpersonal knowledge, and that this knowledge represents the road to truth that has been forged by the cultural and intellectual feats of our ancestors. We are born on this road or pathway, so this knowledge, or road to truth, is our heritage. In order to walk along the pathway, however, we must pick ourselves up through the assimilation of language, and we must acquire a sense of direction through the assimilation of our intellectual heritage. By accepting to walk along the road, we are helping to keep its pathway clear for others who follow behind us. In time, we may even begin to appreciate the contours of the pathway and the scenery along the way, and some may even become instrumental in
helping to build or clear new roadway into the future.

Because the road already forged covers a vast terrain, the assimilation of interpersonal knowledge is a long process. This implies that the student can neither use his assimilated knowledge as an interpretive instrument with the precision of a master, nor can he evaluate the quality and strength of that instrument with the judgment of a master. He must take little steps, crossing logical gaps one by one, all the while following in the footsteps of others who have gone before him. Otherwise, he risks getting lost or going nowhere. There is no one to carry him along—he must walk with his own effort, for knowing is a personal achievement. He can, however, receive tremendous support through the aid of interpersonal knowledge—but he can only accept and use this knowledge if he has an attitude of trust.

(b) Role of the teacher: Since all knowledge contains both tacit and explicit components, traditional knowledge forms or bodies of knowledge also contain a tacit component called "interpersonal" knowledge. Furthermore, organized bodies of knowledge represent the evolution of knowledge of truth. Thus, the passing on of traditional knowledge constitutes the passing on of the tacit, interpersonal knowledge necessary to an understanding of its truth.
Because explicit knowledge is supported by the foundations of its tacit component, this implies that care must be taken in representing this knowledge with a view to the integrity of its underlying truth. All students have a right to an access to this truth through knowledge, for this is their heritage. Although changes in traditional bodies of knowledge may be necessary as a result of the evolution of interpersonal knowledge, these changes should be made by competent members within that discipline and within the agency of that discipline, and not by teachers who are members of an agency (education) that is entrusted to pass on this knowledge.

The role of the teacher depends on the intellectual level of the students. An elementary teacher's role would be to foster and create conditions that enhance the natural trust and effort of the student. The primary role of the secondary level teacher would be to illustrate the complexity and depth of his discipline, as well as the basic unity of all knowledge in order to channel intellectual passions towards the desire for more permanent sources of intellectual satisfaction. At the post-secondary school level, the teacher's role would be to embody the perspective of his discipline in order to awaken the student to a value that transcends the discipline, but that can only be apprehended through it.
(5) Forms of Knowledge. By identifying the tacit as a "form" of knowledge, Polanyi meant to conceptually distinguish tacit in order to show how it functions in all knowledge. He did not mean to identify the tacit as a category of knowledge similar to the traditional forms or bodies of knowledge. However, although the tacit form of knowledge is not equivalent to a traditional form of knowledge, there is nevertheless a relationship; Phenix's analysis of the realms of meaning in relation to the forms of knowledge strongly supports the preceding.

It can be seen that Polanyi's concept of tacit is related to Peters' forms of knowledge concept in terms of the role of culture in the development of knowledge, the development of a conceptual framework, the process of discovery, and the cultural valuation of formal knowledge. Polanyi's philosophy can thus be seen to endorse traditional liberal aims, methods, and curriculum in education, which points to a far richer meaning in his philosophy than the "how to" or purely practical approach that can also be drawn from his philosophy.

(6) Evaluation. Demands for accountability in education led to the practice of shaping curriculum along the lines of instructional objectives, and shaping evaluation of these instructional objectives along the lines of
measurable behaviors.

There are two limitations in this approach: (1) forms of knowing and performance that are difficult to test are omitted. Thus, modes of achievement that are implied in Polanyi's concept of knowing are left out (for example, valuing, understanding, grasping meaning, appreciating and their depth dimensions); (2) these modes are subjective, indeterminate states that cannot be specified beforehand (that is, they cannot be "prescribed" by a behavioral objective). Thus, at best, behavioral objectives specify what a student will do, and not what he can do.

In order to take into account qualitative modes of achievement implied in Polanyi's philosophy, a different type of evaluation model is needed (such as Eisner's Aesthetic Model of educational evaluation) that will take into account diverse qualitative student outcomes, as well as the tacit ability of the teacher to evaluate outcomes that cannot be revealed in empirical, measurable terms.
Conclusion: Philosophical Implications for Education

The educational implications discussed in chapters four through nine intended to show how Polanyi's philosophy informs the general practice of education. Education, however, is more than a practice. It is the substance of a way of life—which is precisely why education is able to be informed by philosophy as well as by psychology. It follows then, that philosophy can inform the substance of education, as well as its practice. Consequently, philosophical, as well as practical implications for education can be drawn from Polanyi's thought, and it is to the former that I will now turn.

The difference can be viewed in the following analogy. The ideals of "Reason" and "Truth", the substance of education that constitutes a way of life, are like eddies in the great flowing river of education. These ideals, like eddies, run counter to the straight flow of the river (the ideal in relation to the practical) and in the process of movement, collect silt and debris that is generated in two ways: (1) by the river (its shores and environment), and (2) by the eddies themselves (their whirlpool action on the riverbed). In other words, the practical notions of reason and truth that run through the river of education (its practice) often end up contaminating the ideal notions of Reason and Truth, whereas Reason and Truth, by their very natures, always
run counter to the flow of the river, thus generating their own type of obstructive debris. (In other words, philosophical thought is characteristically distinct from practice, even though, in practice, it is impossible to dissociate the two.)

An example of the type of obstructive debris that is "eddy-generated" (the philosophy itself) can be seen in the following passage by A.N. Whitehead.

There is Reason, asserting itself as above the world, and there is Reason as one of the many factors within the world. The Greeks have bequeathed to us two figures, whose real or mystical lives conform to these two notions—Plato and Ulysses. The one shares Reason with the Gods, the other shares it with the foxes. (1947, p. 49)

The questions concerning Reason (and Truth), like an eddy, will always be seen to run counter to the questions concerning the type of reason that is shared with the foxes, for the two figures of Reason basically represent the relation between the "ideal" and the "real". In comparison situations, their very natures seem to be contradictory, for they always seem to be going in opposite directions.

What Polanyi's philosophy shows us is that, far from
being contradictory, the notions of real and ideal (reason shared with the foxes and Reason shared with the gods) can be seen as complementary. By establishing the legitimacy of "objective" knowledge through its correspondence with truth, rather than with "method" (chapter 1), Polanyi has linked the real with the ideal (knowledge with truth) and in the process has affirmed the richness and unity of man. (The focus of this chapter will be on the movements, current and historical, that have left man incomplete in terms of Reason and Truth, the substance of his life.)

An example of the "other" type of river debris—that which is river-generated—can be evidenced in just about any educational magazine today. It is the question of educational institutions being coerced into, or freely choosing to satisfy what are primarily social needs and goals through affirmative action programs—often, and most alarmingly, to the detriment of what can be considered purely intellectual goals in light of Polanyi's philosophy. For Polanyi shows us that intellectual "powers" or faculties, and intellectual "passions" are composite and interdependent features of intellectual life (chapter 3), and that appreciation, grasping meaning, and valuing are qualities or states of intellectual life that depend on the exercise of powers for their emergence (chapter 6). Man's social
needs cannot and do not always correspond to intellectual needs that emerge in this way, for intellectual needs emerge as a result of the fine-tuning between tacit powers and passions, and not as a result of fine-tuning between tacit powers and social pressures or political and economic powers. In other words, one will never come to value and appreciate truth for any other reason than for truth itself.

At issue here is not really the state of education, but the much larger issue of the state of Reason and Truth.

The debris generated by the river can so sully the river that we must look long and hard to continue seeing the great eddies that extend from the water's surface to its depths, and that alone contain the notions of Reason and Truth within the river.

Although Allan Bloom has (debatably) been criticized as being sexist, racist, and elitist ("A Most Uncommon", 1988) because of the ideas expressed in his book "The Closing of the American Mind", his ideas can nevertheless help us find and see the eddies of Reason and Truth among all the river debris; furthermore, his ideas provide a formidable historical context in which to view the larger issue of reason and truth within the context of education.

Truth. The main attack on Bloom is his insistence on students' mastery of the foundations of Western civilization.
Cultural relativism, he says, has led to the "openness" of our having to accept everything—that is, of denying reason's power to seek the good through the use of reason as an instrument of judgment, and as the only way of correcting ignorance.

History and the study of culture do not teach or prove that values or cultures are relative. All to the contrary, that is a philosophical premise that we bring to our study of them. This premise is unproven and dogmatically asserted for what are largely practical reasons . . . yet the fact that there have been different opinions about good and bad in different times and places in no way proves that none is true or superior to others . . . the difference of opinion would seem to raise the question as to which is true or right . . . . True openness is the accompaniment of the desire to know, hence of the awareness of ignorance. (Bloom, 1987, pp. 39-40)

Furthermore, Bloom says, although we bring "prejudices" with us as we begin our search for what is true or right, these prejudices are necessary.

Prejudices . . . are visions about the way
things are . . . divinations of the order of the whole of things, and hence the road to a knowledge of that whole is by way of erroneous opinions about it. Error is indeed our enemy, but it alone points to the truth and therefore deserves our respectful treatment. The mind that has no prejudices at the outset is empty. It can only have been constituted by a method that is unaware of how difficult it is to recognize that a prejudice is a prejudice. Only Socrates knew, after a lifetime of unceasing labor, that he was ignorant. Now every high-school student knows that. How did it become so easy? (Bloom, 1987, p. 43)

Bloom's notion of "prejudices" is similar to Polanyi's notion of the "givens" in the circumstances of one's birth that become translated into a worldview, or a particular conceptual framework with its attendant "foreknowledge" that is based on a type of conceptual belief (chapter 2).

Furthermore, Polanyi's philosophy of personal knowledge supports Bloom's claim that the ultimate distinction in knowledge is between error and truth, rather than between subjectivity and objectivity (chapter 1). As Polanyi shows, the connection between personal and objective knowledge
does not guarantee, or even imply, that personal knowledge is protected from error, falsehood, and mistaken assumptions, but does imply, however, that personal knowledge is ultimately the only road to truth (chapter 2). To Polanyi, man's commitment to standards of universal validity enables him to transcend his subjectivity (the particular circumstances of his birth). Thus, although subjectivity is an ever-present threat to the objectivity of knowledge, it does not follow (to either Polanyi or Bloom), that subjectivity cannot be transcended, thereby leading man to a knowledge of objective truth.

The distinction between truth and error that is advocated by Bloom and supported by Polanyi's philosophy of personal knowledge can be seen to be the crux of the matter in current educational reforms. In a recent article entitled "Illegal Education", the author, D. D'Souza, described a number of affirmative action reforms that have been taking place with increasing intensity over the last few years in American universities: for example, the dilution or displacement of core curriculums in the works of Western civilization to make room for new courses that stress non-Western cultures, African-American studies, and women's studies (e.g. Stanford University); the changing of admissions rules at virtually all American universities to enable the selection and
admittance of minority groups, particularly blacks and Hispanics, who have lower grade-point averages than whites and Asian-Americans (e.g., Berkeley University); the establishment of minority faculty hiring quotas, and the recruitment of professors of the "new scholarship" (e.g., Duke University)—deconstructionists, structuralists, reader-response theorists—who have in common the desire to expose the façade of objectivity and critical detachment, especially in law, history, and literature, and thus, to denigrate the idea of inherent meaning in any text, asserting that all interpretations are valid. To these theorists, any work is a product of a specific culture. What they are saying is that objectivity is impossible, and that knowledge is relative to historical and cultural conditions. Standards are acquired through socialization; the error of objectivism is that "its adherents assume a world in which persons are not socialized" (D'Souza, 1991, p. 72).

D'Souza's analysis of affirmative action program reforms concludes that it is the pursuit of truth itself that is being spurned; by reducing all truth to the level of opinion, the "new scholarship" theorists deny the legitimacy of distinctions between truth and error. However, D'Souza argues,

It is one thing to say that our knowledge of ideas
and events is necessarily influenced by a social and historical context, and that in most areas purely objective truth is elusive, even impossible. It does not follow from this view, however, that all theories or interpretations are equally plausible, or that scholarship is incapable of moving asymptotically toward the ideal of truth. The new critics go beyond the assertion of contingent knowledge to suggest that the very ideal of objectivity is a mirage, and that it is therefore perfectly legitimate for teachers to cast aside pretensions of impartiality and to impose their politically preferred ideas on students. When the traditional norms of scholarship no longer rein in the instinct for activism, license is given for uninhibited ideological proselytizing. (D'Souza, 1991, p. 76)

Consider the following:

The African-American scholar Leonard Jeffries claims in class that whites are biologically inferior to blacks and that the "ultimate contamination" of the white value system is Nazi Germany. Such statements are presented to students in the context of Jeffries's own theories about
how the Ice Ages caused the deformation of white
genesis, even as black genes were enhanced by the
value system of the sun. (cited in D'Souza, 1991, p. 54)

D'Souza notes that Jeffries is chairman of the black
studies department at City College of New York, and the
co-author of a multicultural curriculum proposed for all
public schools in the state of New York (1991, p. 54).

Consider also sociologist Becky Thompson, who
acknowledges the ideological presuppositions of her teaching
methodology in the following manner:

I begin the course with the basic feminist
principle that in a racist, classist and sexist
society we have all swallowed oppressive ways of
being, whether intentionally or not. Specifically
this means that it is not open to debate whether a
white student is racist or a male student is
sexist. He/she simply is. (cited in D'Souza,
1991, p. 54)

The ideology exemplified in the preceding examples
"rejects the possibility that human beings can rise above
their circumstances. We are all presumed to be entirely
products of our race, gender, class, and sexual orientation.
All principles and standards are subordinate to political
and social pressure and expediency" (D'Souza, 1991, p. 78).
Furthermore, standards, norms, and traditions are seen as the manifestation of white Western dominance, and the educational institutions themselves are seen as obstacles in the agenda for social change.

The critical question is two-fold: whether or not man is bound by culture, and whether or not traditions and standards, (in particular, those of our Western civilization) are mere ideology.

Polanyi's philosophy addresses both aspects of this two-fold question. In his intellectual life, Polanyi says, man can transcend the subjectivity of his stance by adherence to standards of universal validity, leading him to error or truth. Man is thus not bound by culture, but by truth. And regarding traditions and standards, Polanyi states that since all knowledge is fundamentally tacit, there is a continuum from tacit to explicit knowledge (chapter 2), with admixtures of tacit all along the way. Tradition encapsulates and embodies the tacit component of explicit knowledge, the component that is dynamic and progressive. Although it is true that all knowledge is expressed through individual initiative (personal knowledge), this personal knowledge becomes part of the larger body of formal knowledge when it is accepted by the members of a scholarly community. At that point, the tacit, personal component of personal
knowledge becomes part of the body of tacit, interpersonal knowledge of tradition as well (the component of explicit formal knowledge that is tacit) -- (chapters 2 and 8).

How does a community of scholars know what knowledge to accept, and what to reject? This question refers to the delicate character of "value" (chapter 3). For example, how do scholars know whether or not the "new scholarship" is valuable knowledge, or merely idiosyncratic? Because of the character of value, as well as the consequences of accepting knowledge as "valuable" to a body of formal explicit knowledge (it becomes manifested as orientation in future knowledge, Polanyi says), it is necessary that such knowledge be accepted by the scholarly community. This is primarily accomplished through the selective and heuristic functioning of the individual members' intellectual passions and powers. However, because each individual member is also affiliated with the group or community of scholars to which he belongs, this selective and heuristic functioning extends like a network over the community as a whole. What is special about this process is its safeguards, both against stagnation and against subversive change. For on the one hand, although each individual member dwells within a common framework of thought, thus ensuring stability and tradition for the protection of what has been collectively
deemed "valuable", on the other hand, he is not imprisoned by the framework of this thought, due to the heuristic nature and functioning of his intellectual powers and passions (chapter 3). In this way, change occurs—even revolutionary change, which Polanyi's system allows—but continues to be oriented and progress towards what is collectively viewed as valuable, and continues to be based on the tradition of a common frame of reference.

In Polanyi's system of thought, culture provides a common frame of reference, an interpretive framework. His idea of culture extends from a common framework of thought found in a scholarly community, all the way to a common culture of man with universal standards. But at whatever level of culture being referred to, Polanyi sees it as the liberating mediator between man and truth, and not as the oppressive and suppressive social tie that binds. This slight difference in premise regarding culture means all the difference in the world—for it comes to mean whether one looks "at" or "for" truth. The one that looks "at" looks out, and the one that looks "for" looks up.

Reason. In "The Closing of the American Mind", Bloom states that the foundations and goals of the university as we know it were based on the teachings of the Enlightenment founders. The Enlightenment was a project that sought to
establish and institutionalize a relation between the thinker (theoretical man) and society. The project endeavoured to change the opinions of mankind at large: its founders believed that unity of power (society) and wisdom (the thinker) would and could serve all human beings. The movement was based on the doctrine of rights, where rights were considered to be fundamental passions given by nature that all people have a "right" to satisfy: life, liberty, and the pursuit of justice (Bloom, 1987, pp. 287-288). According to Locke, the social contract was made to protect those rights (Bloom, 1987, p. 362). Since the new order would be based on passions, rather than on the ancient "musings" of virtue, the government of such a regime could be more sure that its citizens would obey civil authority, since it would be a reflection of their wants. The allegiance would be a matter of reason, rather than of faith—for example, if I don't want my neighbour to throw stones and break my window, then I must not throw stones and break his window. The scientist would be respected as the highest "reasoner" and would become both the model and the teacher in the rational order.

Again drawing on the historical context provided by Bloom (1987, pp. 299-300), J.J. Rousseau can be seen as a leading figure of the Enlightenment period whose thought
resulted in a new model of the thinker—that of the artist or bohemian—that was added to the model of the thinker as "scientist". For Rousseau claimed that freedom, more than reason, was what distinguished man.

According to Bloom, Kant also claimed that "natural" science (on which Enlightenment goals were based) left free, moral, and artistic man out of nature. Kant enlarged on the Enlightenment goals by showing that nature, as understood by natural science, did not comprehend the whole of things, and that other realms of experience not able to be grasped by reason and science were just as real. But one need not abandon reason, Kant said, for reason itself could emonstrate that science had limits that natural science denied.

It can be said that Kant tried to show that reason alone was an insufficient guide to understanding experience, and that his philosophy sought to establish the limits in which pure reason can operate. The endeavour to join reason and creativity in a unified concept of man, within the framework of science (chapter 1), seems to have been successfully accomplished by Polanyi through his concepts of personal knowledge, foreknowledge, and the tacit. Furthermore, Kant's consideration of the limits of natural science seems very similar to Polanyi's
objection to the ideal of "complete" objectivity in science, based on his (Polanyi's) premise that the fundamental nature of all knowledge is tacit, and based on his concept of fundamental indeterminacy.

Thus, although there seems to have evolved a consideration of the need for a concept of the whole man (man is a rational and creative being) through the thought of Rousseau and Kant during the period of the Enlightenment, there does not seem to have evolved a way to bridge these aspects of man's being into a unified concept of rational man (to keep within Enlightenment goals)—until Polanyi.

Evidence of the fact that the question of the relationship between reasoning man and creative man had never been resolved is shown by Bloom in his description of the basic divisions that we find in the university: natural sciences, social sciences, and the humanities (1987, p. 372). These divisions, he says, represent different fundamental assumptions regarding the nature of man. For example, natural science says that the non-derivative character of mind—the faculty that sets limits on science and on reason—is shown by evolution to be an accidental effect of evolving matter. We have seen that to Polanyi mind is an emergent, not accidental feature, that occurs as the result of the boundary conditions
of the tacit operating at a lower level of organism functioning (chapter 6). The determinism, reductionism, and homogenization of the natural sciences denies the importance, and even the possibility, Bloom says, of the noble and the beautiful. Thus, the morals and ethics that are the substance of the humanities are taken to be a rather "groundless" substance by the natural sciences. Social science sits somewhere in between: on the same side as the humanities in stating that man is not only body, as natural science claims, but on the opposite side of the humanities in saying that man is the producer of goods, rather than the producer of culture (Bloom, 1987, p. 357).

Whatever the nature of his being, Bloom points out that the Enlightenment founders viewed man as vulnerable and in need of protection, and concluded that protection should come from society, as opposed to nature or God. Man was to separate himself from nature and conquer it through science, thereby creating a culture or society that was founded on reason, and not belief. But reason itself, Bloom claims, the very foundation of a rational regime, is itself the most vulnerable element within that regime. Polanyi would concur with this, as evidenced by his assertion of the indispensability of the authority
of tradition as the embodiment of the tacit, interpersonal knowledge found in the common interpretive framework of a community of scholars or scientists.

Bloom's interpretation of Nietzsche's thought concluded that if reason cannot rule in the domains of culture or soul, then in the end reason itself must be abandoned on purely rational grounds, resulting in the up-rooting of the whole rational regime. Furthermore, if values are not permitted to be derived from nature or history or God, then there is no basis for man's capacity to value--neither reason nor belief--and man is plunged into nihilism. (Bloom, 1987, pp. 196-197)

But, Bloom adds, nihilism can, . . . break him (man) . . . or . . . it can hearten him to a reconstruction of a world of meaning . . . . The faith in God and the belief in miracles are closer to the truth than any scientific explanation, which has to overlook or explain away the creative in man . . . . There are other possible tables of values--one thousand and one, according to Zarathustra--but these were the ones that made this people what it was and gave it a life-style, a unity of inner experience and outer expression of form. There
is no prescription for creating the myths that constitute a people . . . Though the values, the horizons, the tables of good and evil that originate in the self cannot be said to be true or false, cannot be derived from the common feeling of mankind or justified by the universal standards of reason, they are not equal . . . . Nietzsche, and all those serious persons who in one way or another accepted his insight, held that inequality among men is proved by the fact that there is no common experience accessible to all . . . . The individual value of one man becomes the polestar for many others whose own experience provides them with no guidance. The rarest of men is the creator, and all other men need and follow him. Authentic values are those by which a life can be lived, which can form a people that produces great deeds and thoughts . . . Moses, Jesus, Homer, Buddha: these are the creators, the men who formed horizons, the founders of . . . culture. It is not the truth of their thought that distinguished them, but its capacity to generate culture.

(Bloom, 1987, pp. 199-201)
Using as his model the paradigm of science and the culture of the scientific community, Polanyi expressed a philosophy that is similar to Bloom's regarding the nature of the act of discovery or invention, and the characteristic genius of the "original" discoverer. To people like Polanyi and Bloom, the discoverer or the inventor (Polanyi) or the prophet (Bloom) is a rare breed of genius. Unlike Bloom, however, Polanyi adds that the discoverer's original act is renewed by another person's subsequent act of knowing or understanding, and that these subsequent acts of knowing or understanding are no less creative in essence than is the "original" act, for they too cross the same logical gaps. To Polanyi, the crossing of logical gaps is the essence of creativity. Thus, every man can be a creator or discoverer to Polanyi, though not every man can be an "original" discoverer (or prophet, to use Bloom's terminology). Furthermore, every act of discovery, original or otherwise, affirms the creative impulse of man. Also, Polanyi (like Bloom) does not assume that what is discovered can be justified by universal standards of reason (Polanyi's internal pole of rationality), but, (unlike Bloom) must include justification by universal standards of truth (the external pole of rationality in nature). Man becomes more adept at recognizing
rationality in nature by exercising his tacit powers, and extending them over larger domains through the assimilation of articulated frameworks of thought, for his tacit powers are sustained by the subsidiary use of language (insofar as his powers surpass the tacit power range of animals).

Assuming that Bloom's interpretation of Enlightenment thought is correct, it can be concluded that, in the movement to found a regime where man would freely choose a particular way of life because it was reasonable to do so, the great project of the Enlightenment neglected to consider the part of man that chooses as a result of the tacit, heuristic functioning of the creative impulse. This omission, and the lack of its successful resolution—the joining of the rational and creative parts of man in a unified concept of rational man—left a regime founded on an incomplete or, at best, on a non-unified conception of man.

This may have led to even more serious consequences than the basic university divisions that were previously discussed. With all due respect for the complexity of factors involved, and especially with all due awareness of the multitude of social injustices visited upon ethnic and visible minorities—now and in the past—it nevertheless seems reasonable to conclude that as long as
the link between wisdom (theoretical man) and power (society) is really the link between education and economic/political power, then those who are or have been denied access to education (for whatever reason), will demand it. And once they have attained access, if they do not succeed (again, for whatever reason), it seems reasonable that they will institute procedures and demands that will henceforth ensure their success. It seems reasonable, because the criterion of expediency is as logical a criterion of reasonableness as any other.

People like Bloom and D'Souza are asking us to look at another criterion of reasonableness--that of "right", which is part of the great eddy of Truth in the river of education. It is a criterion that has been tacitly assumed, and thus focally ignored by all who have grown up within a liberal tradition (the criterion of "right" is tacitly assumed by all who grow up in any tradition, Bloom claims, except cultural relativists, who claim otherwise), and/or by all who are or have been so politically naive--and hence unthreatened--as to have maintained a psychological link between ideal and real that forms the basis of the liberal tradition, albeit a tacit one. The tradition constitutes a prejudice, but, as Bloom and Polanyi say, a prejudice is really only an
orientation, somewhere to begin—and everyone, even cultural relativists, begin somewhere. The assumptions underlying those prejudices are the real prejudices that dictate the principles of design in the road ahead, and that tell you where and how far you can go.

The correlates of the liberal tradition are that man is a rational being, and that his highest faculty is that of reason. These were the premises of the Enlightenment—an invitation to man to look upwards—to become enlightened by turning on the light of reason. But the Enlightenment neglected to account for man's impulse to value and judge, and thus choose based on a criterion other than expediency. Polanyi showed that there is a creative, heuristic, tacit component that underlies reason, man's highest faculty, and that man is still reasoning, even when he chooses according to standards that are more universally valid than those of expediency. Polanyi's philosophy can thus go a long way towards establishing the missing link that was left out in the great vision of the Enlightenment. For reason alone is very vulnerable, subject to criteria of reasonableness that can be as diverse as men are numerous, since it demands only that the inherent logic of reasonableness be maintained. Anyone's coherent flight
into fantasy can be sustained by reason—and usually is, in many cases of aberrant behavior (which is why a therapist can usually only begin to help someone once he has successfully "decoded" the underlying logic pattern of a deviant behavior). In order for reason to truly serve man—the great goal of the Enlightenment—Polanyi shows us that man's faculty of reason, being an internal pole (with its internal standards of logic) must always be referenced to the external, independent pole of reality (with its inherent standards of truth). Polanyi's method saves reason itself from eventually being cast into the basket of ideology, and along with it, all the rest of what man has come to value and cherish through the exercise of reason. Polanyi's formula for making this link between man and reality is not easy; it implies strengthening the power of man's rational-creative nature by accepting culture—one's social and intellectual heritage—as a condition of growth in that strength. It implies deferring to the greatness of the founders (or discoverers) of culture (social and intellectual) by walking in their footsteps, and crossing the same logical gaps that they crossed. And it implies a trust that through their greatness and through the strength of their tacit faculties, they can help lead us to the promised
land of truth.

Telling man that "truth" exists, but that, because of socialization, one can never attain knowledge of this truth (cultural relativism) is like putting on a light and turning it off. Man is left yearning and incomplete, with no hope nor promise of fulfillment. Much better to leave him in the fullness of his ignorance, with no light of reason ever turned on. He will still hope for, value, believe in, and cherish, for he will have a culture to live by—but he will be ignorant of the part of himself that is missing, and consequently, of how much more there is to hope for, value, believe in, and cherish than he can ever imagine in a lifetime. For, as Polanyi shows us, imagination is a faculty of thought, not belief. He will be half a man, but at least he will be complete unto himself.

Polanyi's philosophy does much to restore the hope and the promise to make man whole again by giving him a method; he thus builds on the vision of the Enlightenment by completing it. Through his concept of personal knowledge, Polanyi's philosophy joins the ideal with the real—the type of Reason man shares with the Gods, and the type of reason man shares with the foxes.

Unlike either the founders of the Enlightenment, who
invited us to gaze upwards by turning on the light of reason, or the cultural relativists, who invite us to gaze outwards only, Polanyi's philosophy invites us to gaze both outwards and then upwards—but adds that there is something there to see.
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Appendix

Brain Physiology and Split-Brain Theory

The brain is an organ that controls perceptual and motor functions in the body. It is made up of two hemispheres, the right and the left, that look exactly alike, but that function differently. Although both hemispheres have a common function (lateral motor and perceptual control), each hemisphere also has a specialized function, and it is the differences in the specialized functions that are the physiological basis of "split-brain" theory.

The differences in the specialized functions refer to how each hemisphere receives stimuli and processes them. The left hemisphere, dominant in most people, processes stimuli by using linear, sequential, and analytical operations, whereas right hemispheric processing uses simultaneous, holistic, spatial and intuitive operations.

Grady & Luecke (1978) list the following modal descriptors for each hemisphere: linear, sequential, verbal, analytic, rational, propositional, explicit and logical for the left brain hemisphere; and simultaneous, holistic, visual-spatial, synthetic, metaphoric, appositional, tacit and intuitive for the right brain hemisphere (p. 9). According to Grady & Luecke, right
and left brain specialized hemispheric functioning is actually two modes of consciousness—the holistic (right) and the analytic (left). These two modes of consciousness can be said to represent two ways of thinking: thinking "visually" (right), and thinking "verbally" (left). The expression of left brain is always verbal (Blakeslee, 1983, p. 195), whereas the expression of right brain is usually in the form of gut feelings or, if the person is right brain dominant, then in non-verbal techniques such as art or drama (p. 26).

The two brain hemispheres communicate by means of the "corpus callosum", a fibrous bundle of nerve tissue that connects both hemispheres. The corpus callosum does not deal in raw sensory information, however, but connects higher associational levels between the two hemispheres. In other words, the information passed between the hemispheres is already processed, higher level information. As each hemisphere seeks to share its expertise with the other, they may at times compete for dominance, depending on the nature of the task and on how each has been allowed to develop in training. The left, however, is usually dominant. (Blakeslee, 1883, p. 147).

Thus, although each hemisphere specializes in a different mode of consciousness, this is not usually
apparent, due to the corpus callosum acting as integrator. Referring to the different ways each hemisphere processes information, Grady & Luecke state that "Reality is not clearly cut into two separate realms of consciousness. But experiments on brain-injured patients and people who have had the corpus callosum severed for medical reasons indicate that two separate and unique ways of processing stimuli exist within one person, and each seems to stem from a separate hemisphere" (1978, p. 8).

Thus, as both systems, formal and informal, operate simultaneously within man, he is able to attend to information in two ways: one featural, and one holistic. Both types of attending combine, due to the communication between hemispheres, to give man an internal representation that is both structural (featural), yet fluid (holistic). These two ways of attending seem to parallel Polanyi's idea of focal and subsidiary awarenesses, and the modal descriptors for each hemisphere's functioning (propositional and explicit for left, and tacit and intuitive for right) seem to parallel Polanyi's distinction between formal and tacit functioning.

Grady and Luecke point out that the idea of right hemispheric functioning is not new, but that we are now appreciating it more because we are realizing the
limitations of purely analytic thought that offers only linear solutions to complex problems—for example, environmental issues, which involve the interaction of many factors, such as humane, economical, and political. Linear, analytic solutions tend to focus on only one factor, often creating more problems than they solve. On the other hand, when the analytic mode is blended with the holistic mode, the holistic mode offers new perspectives on problems and their solutions. Multi-disciplinary approaches to problem-solving and brainstorming techniques are examples of strategies that attempt to combine the problem-solving capacities of both hemispheres, thus using man's whole brain potential as a resource.

According to Grady & Luecke,

When people were more involved and united with nature, the holistic mode coexisted with the linear/sequential mode. As technology advanced, the linear/sequential became more dominant. (1978, p. 34)

It is difficult to determine when the linear/rational mode began to exclude the holistic/simultaneous mode, but possibly it came about when people started to control and exploit nature and began to develop a technocratic and
competitive society . . . . As people attempted
to control natural patterns both within themselves
and in the environment, linear/rational processes
began to dominate and the holistic/simultaneous
mode was ignored and subsequently suppressed.
(1978, p. 32)

The authors make the point that our whole educational
system is based on the linear/rational mode, and that we
must now institute methods and curricula in education
that develop right brain as well as left. The goal is
to have holistic and linear modes operating jointly and
in balance, so that the integrated mode of consciousness—
the "synergetic" mode can operate. The synergetic mode
exhibits traits of unity, synthesis, and balance. It is
at the top of the hierarchy of modes, and although it
operates very infrequently (it is reserved for peak
experiences, rather than everyday ones), it leads to
great results, such as important discoveries. The synergetic
mode (the mode of functioning in a peak experience) occurs
when holistic and linear modes are synchronized: everything
clicks, and new knowledge is created. (Brady & Luecke, 1978,
pp. 37-41)

Functioning in the synergetic mode is very similar to
Polanyi's description of the process of discovery, a process
that involves foreknowledge (part of the linear mode), as well as
heuristic, tacit processes (the holistic mode) to cross
logical gaps.