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Student responsibility and the nature of the learning process.

Peter H. Wagschal

University of Massachusetts Amherst

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STUDENT RESPONSIBILITY AND THE NATURE OF THE LEARNING PROCESS

A Dissertation Presented

By

PETER HENRY WAGSCHAL

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STUDENT RESPONSIBILITY AND THE NATURE OF THE LEARNING PROCESS

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PETER HENRY WAGSCHAL

Approved as to style and content by:

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INTRODUCTION

Who is in the best position to know what a student should learn?

It is with that single question that this entire dissertation is concerned. The excursions in it, which range from Zen Buddhism, to Philosophy of Science, to Cognitive Psychology, to the Physiology of the Eye, and beyond merely represent an attempt to approach the problem from a number of different perspectives. Thus, however far from the well-worn path of education this dissertation may travel, I would beg the reader to keep the single focus always in mind. For that focus remains continually in my mind as I write, and should it escape the notice of the reader that fact merely bespeaks the difficulty of communicating on paper all that needs to be communicated simultaneously.

It would only be fair to say that it is not really the question which dominates all aspects of this treatise. Rather, it is a particular answer to the question which has guided my reading, which has dictated my selection of references and quotations, and which underlies the style and argumentation throughout. I believe that STUDENTS ARE ALWAYS THE BEST JUDGE OF WHAT THEY, INDIVIDUALLY, SHOULD LEARN AT EVERY POINT IN THEIR LIVES. That is my bias, and it is a strong one which permeates all that is written here as a means of defending, explaining, and extrapolating that bias.
As an educator, I am concerned with students - how they learn, what they learn, and what they need to learn. As a man, I am concerned with the more ultimate questions of what knowledge and existence are; of how men are able to answer and even ask such questions; of what it means to be a human being in a chaotic and, perhaps, meaningless world. But, unlike so many of the educators that I know and whose articles or books I have read, I cannot succeed in separating my professional from my human life. Nor do I want to. I teach, I write, I do "scholarly research", and I think about educational issues with the same mind and feelings and as the same person who hugs his wife tightly every night and sometimes refuses to eat her potato pancakes.

This document is, thus, both a demonstration and an explanation of the unique unity-in-diversity of human perspectives. A demonstration in the extent to which my particular biases color all that I write here. An explanation in the conventional sense of logical argumentation, citation of examples, and the building of models of the world. The logic of the argument is painfully simple, and should thus be schematized here so that the reader can see the remainder of this document as variations on a theme or embellishments on a simple picture:

The world exists as no-thing.

Human beings construct their worlds actively out of their experience.

Human experience is private.
Hence, individually constructed worlds are private.

Hence, the constructor knows best what he has constructed.

Hence, the constructor knows best what comes next to keep the structure alive.

Were I to list the individuals who have contributed to the writing of this piece, it would have to include every person I've ever met, every author of every book, article, movie, piece of music, etc., I've ever experienced. Some individuals stand out over others, and they are quoted or referred to throughout. If I have misinterpreted them or been led astray by them, then that is merely another demonstration of the extent of my biases and I make no apologies for it. If I have interpreted them as they intended or if I write things that fit the constructed worlds of others, I place the credit where it is due — in the biases of the influencers and the influenced.
CHAPTER I

There are two kinds of people in this world: those who divide the world into two kinds and those who do not.

It is nothing new to characterize Western Philosophy as variations on the basic theme of realism. The Western "common man" and the more sophisticated Western Scientist are both fairly naive realists.¹ Perhaps, as Benjamin Lee Whorf would suggest,² our language compels us to be realists, though, of course, we would like to think that the universe itself is the source of our compulsion. To put it simply, we tend to believe that the world, with all the characteristics that we perceive in it, exists independently of our observations of it.

Our language, and our attitude toward our language, is more indicative of our basic realism than anything else. The preponderance of nouns and adjectives, for example, is no mere coincidence. Rather, it is an indication of the great extent to which we have categories for our perceptions of the world. But, even more importantly, it is our attitude toward those nouns and adjectives which is crucial. When we say, for example, that a book is an "object" we mean that the book, independent of our contact with it, possesses certain characteristics (perhaps the primary characteristics noted by Locke)³ which, if we perceive them "correctly", make it fall naturally into a natural category of other things which possess the same
characteristics. The world, for us, exists whether we are there to see it or not. Furthermore, it exists with a host of "natural" attributes ranging from primary and secondary characteristics to physical "laws" all of which merely await our discovery.

"Discovery" is, in fact, the key word. We like to think that Newton discovered the laws of gravity in much the same way that Columbus discovered America. The laws of gravity, like America, were always "there", operating in the universe, merely awaiting a Newton to come along with sufficient objectivity and intelligence to find them. Indeed, it is in the progress of Western science, and in our conceptions of what that progress means and how it has occurred, that our realism is most evident (see Chapter III). We are, of course, willing to admit that some things are harder to "discover" than others, but even when we speak of the "mysteries of the universe" we see them as naturally existing mysteries awaiting a discoverer with sufficient vision to see them for what they "really" are.

It is in this context of the knower as discoverer of the objective that some of the features of our language become a bit revealing. We tend to speak of the process of gaining knowledge primarily via the distal senses - sight and hearing. We see the truth. We have visions of Ultimate Reality. A right answer sounds right. Seeing is believing. It is, I would suggest, because we consider sight and hearing to be totally passive, undistorting sensory modes that we place so much confidence in them as means toward knowledge. The sense of touch, for example, will simply not do as a means for us
to gain knowledge. For to touch something is to manipulate it, to change it through interaction with it, to be unsure of how much that one feels is in the thing and how much is in the feeler. It is not coincidence that we always see and hear knowledge, but never feel it. "I see" can substitute for "I understand", but "I feel" cannot. Why? Because we have convinced ourselves that seeing is a very simple process which does not change or distort what is coming into the mind from the world outside. The eye, we believe, is merely a window whose function it is to let the world come into the "mind's eye" as it "really" is. The psychological absurdity of these notions of perception will be discussed later, for it is the implied philosophy of such a perspective, and the extent to which it permeates what we do, say, and even think that concerns me here.

No matter how hard I might try, in 20th Century America, speaking and thinking in 20th Century American, I am doomed to look at the world through the blinders of some form of realism. My language and my entire cultural heritage demand of me that I see myself as an observer of a world which exists independently of me. I am constantly forced to speak of my "self" as a subject which is constantly trying to gain knowledge of objects. The subject is "naturally" different from the object, and the object "naturally" possesses the characteristics which I can come to know if I am "objective" enough. The closest I can come to describing this notion of the universe which we constantly carry around is through the following picture:
We, as observers, touch the world which is a separate entity from our "selves". The knowledge that we gain through touching (i.e., seeing, hearing, smelling, tasting, etc.) the world is more accurate, more valid, the more "objective" it is. That is, the more impersonal my act of knowing is, the more I tend to believe that it is valid. The less of my self I see invested in my act of knowledge, the more I can believe that I have really learned something about that world outside of me.

What is disastrously missing from such an account of the act of knowledge, typical though I think it is of a Western man's approach, is any awareness of the large amount of personal commitment which is required for knowledge of any kind. Indeed, the entire notion of "objective", "impersonal" knowledge is a ridiculous one. Even in Western, dualistic terms, knowledge is always knowledge of something by someone. To equate the purest knowledge with the removal of the knower makes as little sense as it would to equate knowledge with removal of the thing known. As an ideal, objective knowledge is both impossible and ludicrous, a point which Michael Polanyi has made most adequately in his PERSONAL KNOWLEDGE.

Polanyi's argument is an interesting one, and though I don't believe he carries it far enough, it represents a good starting point
for leaving the naive realism which I've been describing above and moving towards what I consider to be a more viable approach to the nature of knowledge.

Polanyi argues that knowledge at all levels depends upon a personal commitment to ideas, values, or beliefs which are not in themselves "known". I am able to know one thing only because I am deeply committed to something else which I do not, strictly, know. But, perhaps, Polanyi's own analogies will help explain his intent. His notions of "personal knowledge" and of the necessity for indefensible commitment as a foundation of all knowledge hinge on the following distinction between Focal and Subsidiary awareness:

When we use a hammer to drive in a nail, we attend to both nail and hammer, but in a different way. We watch the effect of our strokes on the nail and try to wield the hammer so as to hit the nail most effectively. When we bring down the hammer we do not feel that its handle has struck our palm and the fingers that hold the hammer... I have a subsidiary awareness of the feeling in the palm of my hand which is merged into my focal awareness of my driving in the nail.4

There are several things which I see as crucial in the above quotation. First of all, my focal awareness of driving in the nail depends upon my subsidiary awareness of feelings in the palm of my hand. I cannot concentrate on driving in the nail unless I "surrender myself" to those feelings in the palm. Indeed, if I turn the focus of my attention to the feelings in the palm of my hand, I will no longer be able to drive in the nail. Furthermore, if I did focus attention on the feelings in my palm, the act of doing so would require subsidiary awareness of, or personal commitment to, a host of
other matters. I cannot possibly be aware of all that I know, all that I believe, all that I am doing, or all that I value at any particular time. And I cannot be aware of anything unless I surrender myself, commit myself, to a host of unanalyzed, unsupported ideas, values, and feelings.

Polanyi's over-all treatment of "subsidiary awareness" supplies the first step away from the naive realism which seems to me to pervade the West. When, for example, I measure the length of a piece of wood and find myself able to say that "this piece of wood is 27 1/2" long", my participation in that act of knowledge and my confidence in its success rely upon my unquestioning commitment to a whole gamut of beliefs. And as soon as I turn my attention to those other beliefs, I have shattered my original act of knowledge. Measuring that board, for example, requires that I assume the accuracy of my tape measure, and if I begin to question (or even think about) that assumption I am no longer gaining knowledge of the length of the board. I cannot have focal and subsidiary awareness of the same thing at the same time. To be focally aware of anything requires that I have subsidiary awareness of many other things. And my subsidiary awareness is a matter of personal commitment, unquestioning loyalty, living in. In order to know anything, I must live in an entire system of beliefs which I do not and can not question.

Polanyi's treatment of personal knowledge raises one other issue which I find of much interest; he treats knowledge as an act of skill rather than as a product; as a process rather than an end state.
Though much less explicitly than either Dewey or Whitehead, Polanyi seems to be moving toward a cosmology whose basic components are processes and experiences rather than things and ideas. The act of knowledge is defined by the knower's experience, the process he is undergoing, and not by the product he gains through that process. Although Polanyi never comes out and says it, I suspect that he comes close to meaning by "He knows x" that "He has had the experience of living in x."

Whether Polanyi intended to define knowledge as a process or not, I do so intend and it is my difference with Polanyi on this point and on "living in" that will move us toward the cosmology I am proposing here. Rather than arguing, as Polanyi tends to, that knowledge requires skill, subsidiary awareness, and living in, I would contend that knowledge is subsidiary awareness. Knowledge is the process of living in. Furthermore, I consider the crucial element of "living in" to be the fact that it is a totally un-self-conscious process. That is, I have subsidiary awareness of the hammer in the palm of my hand only when I am totally unaware of my "self" "having" such sensations. To put the whole thing more bluntly, I gain knowledge of something when there is no "I" gaining knowledge and no "something" to be gained knowledge of. Or, to sound more Dewey-like, knowledge is neither subjective nor objective. Rather, it is the merging of subject and object; the erasure of the distinction between the knower and the thing known.
The distinction between an act of knowledge as I would describe it and the same act as a realist might describe it can best be exemplified in the following accounts of the skill of a master chess player:

REALIST: What makes the master chess player invincible is the fact that he is capable of "planning ahead" more moves than the average player. Each time a master chess player makes a move he has considered several other possibilities and consciously rejected them because of their foreseen consequences. The master chess player is able to carry the sequence "If I do this then he'll do this and I'll do this and he'll do this..." out to more terms than the average player.

ME: Your description of the master chess player may apply to a good chess player, and it may describe a "stage" through which most masters go along the way toward becoming masters, but it does not describe the Master at work. The Master does not plan ahead self-consciously and analyze the merits of all possible moves. Rather, he concentrates on the board and the game until he is completely un-self-conscious; until there is no master, no opponent, no chess game. The Master is able to live in the chess game he is playing and he moves with the pattern that is both he and the game. (My thanks are due to Stuart Thorsby, a master chess player, for this example.)

By his living in the game, by his discarding the distinction between himself and the game, the master chess player is participating in an act of knowledge as I would describe it.

Knowledge, as I am describing it, is a process and is defined by the feeling of the knower. Indeed, "I feel" seems to me to be much closer to "I understand" than is "I see." When a person achieves the feeling of total un-self-consciousness about whatever he is doing, he
is participating in an act of knowledge. What the person is doing is really irrelevant, for it could range from chess playing to reading a book to performing a chemistry experiment to making love. How the person does what he does, in what spirit, with what feeling, and with how much "awareness of self" — these are the things which define acts of knowledge.

Such acts of knowledge have been described and analyzed by a host of other authors in a wide variety of different contexts. When William James wrote about the varieties of mystical experience he was describing such acts of knowledge. John Dewey's descriptions of the aesthetic experience amount to the same. Arthur Koestler's analysis of creativity in humor, art, and science is an attempt to focus on such experiences. Descriptions in the history of science of "flashes of insight" (Archimedes' bathtub experience, or Galileo's confidence in \( s=\frac{1}{2}gt^2 \), or Kekule's carbon-chain dreams or Watson and Crick's immersion in their atomic models...) have the same subject. The Zen literature from its Koan's to its tales of satori speaks of such acts of knowledge. The more recent psychedelic literature is focused almost entirely on describing such "non-self" experiences. And this list could go on and on and on.

But, interestingly enough, some of the most vivid and meaningful descriptions of the act of knowledge come from the world of the schizophrenic (a fact which I will take up in a later chapter). Consider, for example, the following description taken from Karl Jaspers' GENERAL PSYCHOPATHOLOGY:
I believe I caused the illness myself. In my attempt to penetrate the other world I met its natural guardians, the embodiment of my own weaknesses and faults. I first thought these demons were lowly inhabitants of the other world who would play me like a ball because I went into these regions unprepared and lost my way. Later I thought they were split-off parts of my own mind which existed near me in free space and thrived on my feelings. I believed everyone else had these too but did not perceive them, thanks to the protective successful deceit of the feeling of personal existence. I thought the latter was an artifact of memory, thought-complexes, etc., a doll that was nice enough to look at from outside but nothing real inside it.

In my case the personal self had grown porous because of my dimmed consciousness. Through it I wanted to bring myself closer to the higher sources of life. I should have prepared myself for this over a long period by invoking in me a higher, impersonal self, since 'nectar' is not for mortal lips. It acted destructively on the animal-human self, split it up into its parts. These gradually disintegrated, the doll was really broken and the body damaged. I had forced untimely access to the 'source of life,' the curse of the 'gods' descended on me. I recognized too late that murky elements had taken a hand. I got to know them after they had already too much power. There was no way back. I now had the world of spirits I had wanted to see. The demons came up from the abyss, as guardian Cerberi, denying admission to the unauthorized. I decided to take up the life-and-death struggle. This meant for me in the end a decision to die, since I had to put aside everything that maintained the enemy, but this was also everything that maintained life. I wanted to enter death without going mad and stood before the Sphinx: either thou into the abyss or I!

Then came illumination. I fasted and so penetrated into the true nature of my seducers. They were pimps and deceivers of my dear personal self which seemed as much a thing of naught as they. A larger and more comprehensive self emerged and I could abandon the previous personality with its entire entourage. I saw this earlier personality could never enter transcendental realms. I felt as a result a terrible pain, like an annihilating blow, but I was rescued, the demons shriveled, vanished and perished. A new life began for me and from now on I felt different from other people. A self that consisted of conventional lies, shams, self-deceptions, memory images, a self just like that of other people, grew in me again but behind and above it stood a greater and more comprehensive self which impressed me with something of what is eternal, unchanging, immortal and inviolable and which
ever since that time has been my protector and refuge. I believe it would be good for many if they were acquainted with such a higher self and that there are people who have attained this goal in fact by kinder means.

Similar descriptions of "ego-loss" experiences, acts of knowledge, abound in much of the existential literature and in such lucid compilations of the experiences of schizophrenics as Bert Kaplan's THE INNER WORLD OF MENTAL ILLNESS.

Certainly, deeply religious experiences are precisely the same kind of thing and at a level of intensity equal to or greater than that described above. As R.D. Laing argues in his excellent THE POLITICS OF EXPERIENCE,

Most people most of the time experience themselves and others in one or another way that I shall call egoic. That is, centrally or peripherally, they experience the world and themselves in terms of a consistent identity, a me-here over against a you-there, within a framework of certain ground structures of space and time shared with other members of their society.

...all religious and all existential philosophers have agreed that such egoic experience is a preliminary illusion, a veil, a film of maya -- a dream to Heraclitus, and to Lao Tzu, the fundamental illusion of all Buddhism, a state of sleep, of death, of socially accepted madness, a womb state to which one has to die, from which one has to be born.

The 'ego' is the instrument for living in this world. If the 'ego' is broken up or destroyed (by the insurmountable contradictions of certain life situations, by toxins, chemical changes, etc.), then the person may be exposed to other worlds, 'real' in different ways from the more familiar territory of dreams, imagination, perception or fantasy.

What I am calling an act of knowledge is not, except in my willingness to allow for such experiences in much less intense manners, different from the above accounts. Nor do I see any difference in the following taken from the Gospel according to Thomas:
Jesus said to them:

When you make the two one, and when you make the inner as the outer and the outer as the inner and the above as the below, and when you make the male and female into a single one, so that the male will not be the male and the female not be female, when you make eyes in the place of an eye, and a foot in the place of a foot, and an image in the place of an image, then shall you enter the Kingdom.
CHAPTER IX

WHAT WE THINK IS LESS THAN WHAT WE KNOW;
WHAT WE KNOW IS LESS THAN WHAT WE LOVE;
WHAT WE LOVE IS SO MUCH LESS THAN WHAT THERE IS;
AND TO THAT PRECISE EXTENT WE ARE SO MUCH LESS THAN
WHAT WE ARE.

If the act of knowledge is to be conceived as I have described it, then the world must exist in quite a different manner than we, as realists, tend to assume. If knowledge is feeling, ego-loss, process, then the "real" world must be built of different stuff than we normally assume. Let me begin to describe what the world must be like if acts of knowledge as I have described them are to be taken seriously.

An "act of knowledge" in any philosophical scheme, including mine, must have something to do with the "knower" getting in touch with "reality". The question to which this chapter must address itself, then, is the ontological one of what kind of "reality" it is that a person gains knowledge of by living in. If knowledge is not gained in the traditionally described manner, if verbalization is not a key component of knowledge, and if ego-loss is crucial to knowledge, then the world of language-bound concepts and categories must be illusory in some sense of the word. To put it more radically and succinctly, the world is "really" an undifferentiated whole which we have become accustomed to slicing up in arbitrary manners. There are no naturally existing categories in the world, and any such categories which we use are our arbitrary inventions. The fact that human beings use and perceive the world through conceptual schemes says more about the way in
which man shapes his perceptual world than about what the "world" is like. The world exists naturally as "no-thing" until man comes along and creates things through his active processes of perception (see Chapter VI).

Consider some simple examples. There is a new book sitting on my desk which I have never seen before. I look at the front of it, then walk around the desk and look at it upside down. My two perceptions (the book cover right-side-up and the book cover upside down) are completely different. The two visual fields have nothing in common. And yet, I comfortably say that I am "seeing the same thing" in both cases. The "thing" that I see is my creation, not the world's. If I find it easy to attribute those two perceptions to an "object" called a "book" which exists independently of me with definable characteristics, that is because I have arbitrarily created for myself a whole system of categories for looking at the world. It is the system of categories that requires me to see a "book", not the "pure" information from the world.

The arbitrariness of our "slicing up" of reality is, of course, more obvious in the words and concepts that we use than in our perceptions of the world. It is not terribly difficult, for example, for us as realists to admit of a certain amount of fuzziness in distinguishing between such abstract categories as "life" and "death". When it comes to answering such questions as "Is a man dead when his heart stops even though most of the cells in his body are still alive?" we will admit to a certain amount of high-handedness in arbitrarily drawing a line somewhere. But we will continue to insist that the two
categories are "basically" sound - that a living man is naturally different from a non-living rock. And, much more fundamentally, we will insist that the perceived separateness of different objects is, indeed, natural and not dictated by our arbitrary whims. After all, we would insist, "I" am a different "thing" from the "typewriter" I am now using. But, am I? "Really"?

If the world is more like the above picture than the picture on page four, Chapter I, then am I? "Really"?

Let us consider, for the moment as a possibility only, the "real world" as depicted in the picture above. In such a world, all distinctions, all categorizations, all "slicings up" of the world are inaccurate, for the world is "really" an undifferentiated whole. Any distinctions between objects or characteristics that are made in such a world are inaccurate in the sense that they are arbitrary, man-made, and not dictated by the nature of the world. In such a world, the words and categories which human beings employ are arbitrary and not required by naturally existing differences among "objects" in the world. I must also note that in such a world of complete lack of differentiations, one can, if he chooses, divide the world up into
categories in an infinite number of ways, all of which will "work" equally well. A world which is not divided into parts at all can be categorized in an infinite number of ways. Just as I can take a piece of clean white paper and cut it up in an infinitude on manners, so can I arbitrarily impose an infinitude of category systems of an undifferentiated world.

Most importantly, the existence of a reality which is completely undifferentiated requires us to give up our fundamental distinction between subject and object. As depicted in the figure above, the subject which touches the world is the world which it touches. The distinction between subject and object, knower and the known, is as artificial a contrivance as any other set of categories which we might impose on the world. The point whereat a person decides that his "self" ends and the "world" begins is as arbitrary a distinction as any of the others which we make. Does my "self", include all of my body, or only part of it, or none of it? Does it include the clothes I am wearing? My most valued possessions? My most intimate friends? The answers to such questions are arbitrary and whimsical, since "in fact" the assumption that there is some naturally valid distinction between self and non-self is an invalid one.

Perhaps an analogy will help to describe the undifferentiated world as I would have the reader see it, though the ontology I am describing makes analogizing, and verbal description of any kind, a dangerous and shaky business. A world which has no naturally existing categories cannot be described adequately in words which are, by definition, categories. For the reader who wishes to see as good a
verbal description of the non-verbal world as I can imagine, I recommend the last chapter of R.D. Laing's THE POLITICS OF EXPERIENCE.¹

By emphasizing certain aspects of recent developments in laser beam photography, however, I can come close to supplying a useful analogy for describing the naturally uncategorized world. The method produces a photographic plate, called a "hologram", which has interesting properties. Looked at in natural light, the hologram is merely a mass of wavy, orange-red lines - interference patterns of light produced in the process of making the "photograph". But when the entire plate is illuminated from behind by high intensity light, the object photographed appears in color, with three dimensions, and depth of field (i.e. by moving one's head to the side of the hologram, one can see around and behind objects in the picture). And if any small piece of the hologram is illuminated with a high intensity light, the entire photograph is visible, still in color, three dimensions, and with depth of field. The entire picture is contained in the totality of the hologram, as well as in every point of the hologram.

The world is like a hologram. Every point is exactly the same as every other point, and every point is exactly the same as the whole which is exactly the same as any combination of points. The analogy breaks down at only one place: when we talk about the hologram we can speak of separate points which we can distinguish from one another by their location in space. The world is like a hologram in which nothing can get outside to distinguish the "separate" points.

"There is no way to step off the treadmill. It is all treadmill." (Wallace Stegner, ALL THE LITTLE LIVE THINGS)²
Or, if you prefer, the world is like a hologram without distinguishable points.

Before proceeding to defend this conception of the world as hologram, a few words must be said about words. A reality which is undivided cannot be adequately described by any process which divides, and language is by nature such a process. To merely utter a word is to divide a reality which is not, in itself, divided. The world as hologram and knowledge as "living in" are simply not susceptible to adequate verbalization since the very use of words negates the crucial notion of unity. On the other hand, it would be far from the mark for the reader to conclude that the ontology which I am describing requires human beings to refrain from ever using words. For words, like every "thing" else in the world are points on the hologram, thereby containing all that the world is. To put it another way, one can as easily (or with as much difficulty) live in language as one can live in anything else. The dangers and advantages of language are the same as the dangers and advantages of non-language, for knowledge is an act, a process, not a "thing". Consider the following Haiku poem:

The old pond.
A frog jumps in,
The sound of water.

Insofar as we analyze, divide, interpret, project symbolism and in any other way separate ourselves or the world from the poem, we are not gaining knowledge. But insofar as we live in the poem, feel it, feel ourselves in it and it in ourselves, we are gaining knowledge — the same knowledge, in fact, that the master chess player is gaining, for all points of the world-hologram are the same.
Any situation in which a human being finds himself is potentially a source of knowledge, including those situations which require the use of language. The point is not so much that language is "bad" but that it is a mistake to equate any verbal statement with knowledge. For knowledge is a process, a feeling, an experience which may or may not involve the use of language. And the same kind of argument applies to language as a communicator of knowledge. If you, reader, are living in the words you are reading, then I have communicated knowledge to you in the sense of having provided the context for an act of knowledge. Somewhat more intensely, if I am living in as I write and you are living in as you read, then we are communicating, at least vicariously. And more intensely still, if you and I ever have a conversation (verbal or non-verbal) wherein we live in each other, then we are communicating indeed. Once again, communication cannot be equated with the words used or even the lack thereof. Rather, it is an act, a feeling, an experience which may or may not employ language.

Besides providing opportunities for living in, words can also have the function of leading people toward the experience of knowledge. A verbal tract like this one might, for example, be the goad which eventually leads some reader to experience an act of knowledge which he might otherwise not have experienced. Far more likely, the lengthy and profound consideration of some verbal puzzle might lead to such an experience. Clearly, such is the intent of the Zen Koan. If one can immerse oneself deeply enough in the consideration of such a question as "What is the sound of one hand clapping?" one might well lose one's
self and thereby experience knowledge. Similarly, I would claim, the
deep reflection on any verbal statement or on any word can achieve
the same end. If the reader has the forebearance to think lengthily
about any question or any word he thereby opens himself to the
possibility of discarding his self, seeing through the words, and
experiencing knowledge.

But consideration of language and its functions, as well as of
differences in language from culture to culture, also supplies an
avenue for supporting the notion of the world-hologram. In addition
to the large intra-cultural differences in language structure, there
are systematic and significant differences in the structure of
languages of different cultures. And, as Benjamin Lee Whorf long ago
pointed out, the structure of a culture's language to some extent
determines the way in which the world is seen in that culture. It
simply makes no sense to ask which language is a more valid represen-
tation of the world. The world is irrepresentable in language, and
any language which arbitrarily divides it into categories can be made
to "work" as well as any other. Unless one is willing to tolerate the
notion that some languages are "better" than others as describers of
the "real" world, one must begin to make room for the notion that
there is an undifferentiated world out there which can be "handled"
by an infinite number of languages.

Consider the by now classic example of Eskimo words for snow.
There are well over half-a-dozen different words for snow in the Eskimo
language, each of which refers to a different kind of snow. The
distinctions made by those words are ones which we who use English customarily overlook. We simply do not slice that "part" of the world up as systematically as do Eskimoes. Similarly, there are realms of time distinctions and social-class-politeness distinctions in the Japanese language which we have never even considered making. We do not slice the world up that way, and part of the reason is that our language provides no avenues for doing so. It does not force us to make some distinctions which Japanese does force on its users. Now, the question of "Which language is 'right'?" is obviously an absurd one. The different languages represent rather drastically different modes of categorizing the world and, since there are no "natural" categories in the world, none of the languages are ultimately "right", all are equally in error by virtue of having made the same mistake, and all can serve the valuable functions of communicating and leading toward acts of knowledge that I have described above.

There will be those who would claim that the spectacular rise of science in modern times represents the attainment of a "universal language" and thereby a valid set of categories for describing the universe. And it is quite clear that modern, technological societies do, indeed, look to Science for answers to questions regarding the "real" nature of the world. The important point is that when one looks at the process of science carefully, as we shall do in the succeeding chapter, one finds that the nice, neat category systems, the theories of the universe, and the carefully designed models are as arbitrary and ultimately indefensible as any other attempt to slice the world into parts.
Despite widespread difference, Twentieth Century philosophers of science tend to agree on one crucial point: that scientific knowledge can never be either complete or certain. Some would argue that knowledge of reality is at best probabilistic; some would argue that scientific models are at best abstractions which can be more or less useful, but never known to be true, and some would argue that the degree of personal commitment involved in knowledge of any kind makes "objective" knowledge impossible. Poincaren as far back as the beginning of this century, has proved to his satisfaction (and to that of many others) that the total realm of existing "facts" concerning the world at any time, can always be explained by an infinite number of theories. That is, the "universe of experience" which any man or mankind has on hand at any time, can be sliced up, explained, and accounted for in an infinite number of ways. No surprise if the world is the undifferentiated hologram I have been describing.

In a somewhat more sophisticated manner, Tarski has developed a similar proof:

In a logical demonstration closely akin to the proof of Godel's theorems, Tarski has shown that any formal system in which we could assert a sentence and also reflect on the truth of its assertion must be self-contradictory. Thus, in particular, the assertion that any theorem of a given formal language is true, can be made only by a sentence that is meaningless within that language.

To put the conclusion more simply, if I say "That is a book" and then say "It is true that that is a book," I have contradicted myself (see Tarski's proof, if you desire a good deal of rigor). And if I say "That is a book" and then wish to reflect on the truth of that
statement, I can only do so in a language that has no meaning in English. A vicious bind for one who would describe the secrets of the universe via language. A commonplace for one who feels the undifferentiatedness of the world-hologram.

In a sense, then, I would take these descriptions of the difficulties of science and the varieties of language across cultures as evidence for the world-hologram ontology. But, at the same time, I must caution the reader against taking the word "evidence" too seriously within my framework. Language and the canons of logic are not grounds for evidence in such a world. If categorization is misleading, then self-contradiction is no more so and, in fact, might be less so. From my framework, the statement "Black is white" makes as much sense, if not more so, than the statement "black is black." Evidence, within my scheme, must always be experience, feeling - an act of knowledge.

Ultimately, "evidence" for the ontology which I have presented can only lie in the personal experience of individuals. I would, in fact, urge the reader to survey his personal experiences for instances of what I have been calling "living in." I would be surprised if many readers could find examples of "loss-of-self" experiences in their lives that approach the intensity of those cited in Chapter I. I would be equally surprised, however, if any reader failed to find such experiences in his life on a less grandiose scale.

Extreme proficiency at any skill would provide opportunities for knowledge experiences as I have defined them. Driving a car, participation in sports, craftsmanship, artistic creation, scientific insight (the experience, not the later verbalization), dancing, musical
performance - any act which so absorbs the actor that he no longer exists as an actor. But "living in" can occur passively, too. Gazing at a sunset can be an act of knowledge insofar as the observer is thereby divested of his self-hood. Reading a book or poem, listening to music, watching a dramatic performance, looking at a work of art or of nature - all can be acts of knowledge if and only if the observer is not separated from the observed. If he lives in it, experiences himself as it, is it.

To document the occurrence of such experiences in the history of mankind seems to me an unnecessary endeavour at this point. William James and others have done it for religious experiences. R.D. Laing, Bert Kaplan and others have done it for "psychopathic" experiences. John Dewey, Susan Langer, and others have done it for aesthetics. Alfred North Whitehead, Jean Paul Sartre, Alan Watts, D.T. Suzuki and others have done it for philosophy. Michael Polanyi, Alan Taton, Arthur Koestler, and many others have done it for science. And Susan Langer, Arthur Koestler, and others have done it for everything in their attempts to tie all creativity and knowledge (artistic, scientific, dramatic, literary, humorous, etc.) under one rubric. The existence of such experiences has been thoroughly documented. Their "meaning" has been frequently discussed, analyzed, and argued. Conviction, commitment, and knowledge of the world-hologram can only come through the reader, not from external verbiage.
What we think is less than what we know;
What we know is less than what we love;
What we love is so much less than what there is;
And to that precise extent we are so much less than what we are.

Or, if you prefer:

There is no way to step off the treadmill.
It is all treadmill.

Your move, reader.
CHAPTER III

The real world has become so fantastic that satire... is discouraged because reality outdistances it.

The dispassionate intellect, the open mind, the unprejudiced observer, exist in an exact sense only in a sort of intellectualist folk-lore,...

It would be difficult, if not impossible, to over-emphasize the influence which the Scientific Revolution has had upon the life and thinking of Western Man. To be sure, such influences (and especially this particular one) are reciprocal and I have no desire to argue over chicken-and-the-egg questions here. However one looks at it, popular notions of the scientific process and its philosophy seem to me to be excellent indicators, in the Western world, of the popular Weltanschauung. The common man's philosophy of science tends to be his philosophy of the universe, because we all tend to see Science as the most legitimate approach to Truth.

I need to talk at some length about Philosophy of Science, then, because of its importance as a barometer of popular philosophy. Furthermore, this chapter on Science will serve as a bridge between the more general philosophy described in the preceding chapters and the highly specific psychological models described in subsequent chapters.

If Western Man is a realist in his basic view of the world, he is a super-realist in his perspective on Science. When we talk about the high points in the history of science, we speak of "discoveries,"

Scientists report their "findings" in journals. The basic "stuff" of science is data (i.e. "things given") which are better the more they are untouched by human hands and minds. Laws and experiments are more valid the more objective they are - i.e. the less they reflect the commitment and biases of human beings. The laws, harmonies, and order of the physical universe are "out there" waiting for us to discover them, and we are most likely to do so if we can strip away our biases and preconceptions. Science does not impose order on a chaotic universe, it searches for the system which is already there, however deeply and mysteriously hidden.

Let us look at some classic examples of this view of science which I claim to be the currently predominate one. Galileo rolled some balls down some inclined planes. He measured the distance the balls moved in various time intervals. The measurements were made with as exacting care as could be in those days. Galileo then looked at those "data", computed the acceleration of the balls down the planes, and thereby discovered the Law of Falling Bodies (s=1/2gt^2). The "Law" virtually sprang forth at him from the objective data.

Johannes Kepler, having spent years immersed in a storehouse of accurate data on the movements of planets, finally sees his Three Laws. The data, accumulated over many years by many people (particularly Tycho Brahe) who were relatively unbiased and therefore objective, forced Kepler to come to the conclusions that he eventually arrived at. The three laws of planetary motion were, if you will, embedded in the data, awaiting the keen insight of a man like Kepler to discover them.
Robert Boyle, perhaps the most objective data-gatherer that science has ever seen, discovered Boyle's Law by inspecting some accurate data regarding air in a j-tube. The unbiased organization of those data revealed the fact that pressure and volume of a gas vary systematically with one another. It required the careful, unbiased talents of a Boyle to gather data which were sufficiently uncontaminated to arrive at the measurements of pressure and volume which revealed Boyle's Law.

Gregor Mendel spent the major portion of his life raising flowers, systematically cross-fertilizing them, and carefully recording the attributes of the resulting off-spring. Over a period of years, the data showed certain regularities and systematic relationships between the traits of off-spring and the traits of ancestors. Upon inspecting these masses of results, Mendell discovered his basic Laws of Genetics.

Kekule, the father of organic carbon-ring chemistry, arrived at the conclusion that the benzene molecule has a ring structure through careful analysis of detailed data regarding the chemical properties of benzene. Experiments with benzene, comparisons of its chemical properties and behavior with that of other straight-line organic compounds, convinced Kekule that benzene could not possibly be such a molecule and that it had to be structured like a ring in order for it to behave as the data showed that it does.

We could go on, but, after all, enough is enough. I should, perhaps, apologize for setting up such a straw man, but I'm not sure that I have done so. I know of too many 19th century philosophers of science (and of history and a few other things, for that matter) who
argued in precisely such a vein. I know of too many social scientists in the Twentieth Century who see their science in such a light. And I know of too many non-scientists who see all of science as such an objective process of discovery, to be able to dismiss the argument as a strawman. If the view of science implied in the above historical accounts seems incredibly naive and weak to the reader, it is not because no one has that view. It might, in fact, be wise for the reader to stop at this point and analyze his reactions to those paragraphs. Do the descriptions seem plausible? Do they represent the process of science as you tend to view it? If not, where do they fall short?

In order to describe the process of science in what I consider to be a more accurate light and spirit, let me recount the "discoveries" I have mentioned above in a somewhat different manner. Galileo, upon inspecting a series of fairly inaccurate measurements of balls rolling down inclined planes, manipulated them so as to produce a systematic, harmonious relationship. The sheer harmony, beauty, and simplicity of that relationship, and the number series it produced, convinced Galileo that his equations were correct. Galileo was intuitively certain of his equation and felt a strong personal commitment to it. He then proceeded to conduct a host of experiments with balls rolling down inclined planes (and his heart as a time piece!). Although the "data" were sloppy and thus far from, in themselves, confirming his conclusions, he considered them to be close enough to what he knew, intuitively, was right to consider them as evidence for his conclusions:
Here we have a typical example of Galileo's method in physics: Imagine the conditions of a given situation, make a mathematical formulation and derive the reasonable consequences, then make a rough check, if it seems necessary, to be sure that the result is correct. In 'experiments near an hundred times repeated,' Galileo found that the times agreed with the law, with no differences 'worth mentioning.' His conclusion that the differences were not 'worth mentioning' only shows how firmly he had made up his mind beforehand, for the rough conditions of the experiment would never have yielded an exact law. Actually, the discrepancies were so great that a contemporary worker, Pere Mersenne could not reproduce the results described by Galileo and even doubted that he had ever made the experiment. In his DIALOGUE ON THE TWO GREAT SYSTEMS OF THE WORLD, Galileo has one of his characters ask whether he had made an experiment on a given point, to which Galileo responds:

No, and I do not need it, as without any experience I can affirm that it is so, because it cannot be otherwise.

Kepler, immersing himself for years in detailed observations of planetary motion and, in particular, a small discrepancy in the orbit of Mars, had what can best be described as a "religious conversion" or "flash of insight" which convinced him irrevocably that the Earth was not the center of the universe, and that his Three Laws of Planetary Motion were True. Kepler's belief in his three laws was particular confirmed to him by the fact that they provided a framework within which complete harmony and geometric unity could be seen in the universe via a system of regular geometric solids progressing outwards from the Sun. Thus confirmed in his views, Kepler spent well over three years monkeying with the data on Mars in order to get it to fit into his scheme of things. Eventually, of course, he succeeded and all seemed well. But it is at least somewhat ironic to note that Kepler was a terrible mathematician, and was saved in his calculations
only by the fact that his arithmetic errors cancelled each other out. When one runs Kepler's original data through a computer, one gets very nearly the same results as Kepler achieved, but one also finds that he made thousands of arithmetic errors which happened to cancel each other out. In any case, Kepler "knew he was right" long before he turned to the data for confirmation.

Boyle is an even more interesting case. He was, indeed, one of the most "objective" data-gatherer's that science has ever seen. In fact, he spent the major portion of his life gathering and recording data in minute detail - most of which has never been used, and never will be since it relates to no theory that anybody cares about at the moment. Boyle conducted his J-tube experiments in order to disprove one of the going theories about nature's abhorrence of a vacuum, and having done so he characteristically stored away in a closet all his detailed observations on the levels of mercury in the tube. It took one of Boyle's assistants, considerably more theoretically inclined than he and much interested in the then current notions of atmospheric pressure, to weed through those j-tube data, organize them in a highly abstract way, and invent the system of equations that could come close to making them all fit. Boyle was, if you will, far too "objective" to be able to invent Boyle's Law.

Mendel is, perhaps, one of the best examples of science taking its own realism too seriously. Mendel's data in support of his laws of genetics are, to put it bluntly, much too well in agreement with his theory to have been "real". Replication of Mendel's expériments
has always shown a much larger spread of data, and though general agreement with the Laws still pertains the fit is never anywhere near as close as Mendel claims to have gotten. What seems to have happened is that Mendel's personal commitment to the laws was so intense that he manipulated his data quite substantially in order to show extremely close agreement with his theory. The moral for scientists is fairly clear - if you're going to fudge your data to make the theory you believe in look good, don't make it look too good or it will look bad.

Kekule's descriptions of the process whereby he arrived at his benzene ring hypothesis are among the most honest and revealing documents in the history of science. Kekule did immerse himself deeply in the data on benzene and was dissatisfied with current explanations of the structure of that compound, but the data did not give him any guide as to what that structure might be. The guide and inspiration, and the conviction in his ideas, came from his dreams.

I turned my chair to the fire and dozed....Again the atoms were gambolling before my eyes, This time the smaller groups kept modestly in the background, My mental eye, rendered more acute by repeated visions of this kind, could now distinguish larger structures, of manifold conformation; long rows, sometimes more closely fitted together; all twining and twisting in snakelike motion. But look! What was that? One of the snakes has seized hold of its tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke...Let us learn to dream, gentlemen.

Kekule's certainty came from a dream, not from his data.

The process of science, as I am describing it, is a far more personal enterprise than we commonly believe. And the traditional arguments that science gains its values through its "objectivity" or
"usefulness" or "predictive value" seem to me to be little more than smokescreens which obscure the intensity of the scientists' commitment to his work. The scientist is, after all, a creator, not a discoverer. Galileo's laws of falling bodies, Kepler's Three Laws of Planetary Motion, Boyle's Law, Mendel's Laws of Genetics, and Kekule's benzene-ring model are creations which can be, and have been, imposed on a universe which is sublimely indifferent to systematization. The value of those creations, and the commitment to their validity, has its origins in the creative act of the scientist, in his feeling of commitment, in his flash of insight or "Eureka" experience. Science can no more be "objective" than any other human enterprise, for it rests on the personal values, biases, and feelings of those who engage in science. And, in a very real sense, the entire super-structure of science is little more than rationalization and extension of the collective biases of scientists who see the world through similar sets of rose-colored glasses.

The argument will be made, as it has been so frequently in the Twentieth Century, that the validity of a scientific theory resides in its utility, its ability to predict future events. A theory which gives accurate predictions is "probably true" and one which does not is "probably false." But the simple-mindedness of that explanation leaves all too much out of the scientific picture. If, for example, we believe scientific theories on the basis of their accurate predictions, then why have we bought Einstein's General Theory of Relativity in the complete absence of confirmation of his three predictions? And why have Miller's experiments, replications of the Michelson-
Morley experiment which contradict the Special Theory of Relativity, been relegated to oblivion? Even more importantly, what do we do with Heisenberg's Uncertainty Principle which, in essence, claims that we can never predict accurately?

The images of Science as Predictability and Utility are little more than extensions of our wish to believe in the objectivity of science. We like to think that theories, admittedly developed by men, are capable of proving themselves wrong or right with virtually no interference from human bias. If a theory's predictions bear out, it is true, if not it is false. But we continually neglect in such neat formulations the crucial element of human conviction and commitment. To a large extent, the theories of Galileo or Mendel or Einstein have led to successful predictions because we believed in them. If we are looking for answers that confirm a theory, we will find them, and if we are not, we will not. When we believe in a theory, we accept sloppy data that confirm it easily, and we work hard to reject tight data that disconfirm it. This is not to say that data are totally irrelevant to Science, but it is to say that data is much less relevant to the convictions of individual scientists than we like to believe. The irony of the situation is that the individual scientist is far less likely to be convinced by data than is the non-scientist. The scientist is persuaded by his dreams, his insights, his convictions, and his visions. The laymen is convinced by words and numbers he doesn't understand, but which carry the weight of the scientist's personal conviction shrouded in what has, for us, become a Holy Language.
The reader who finds my arguments against predictability and utility as the basis of scientific validity to be intriguing but unsatisfactory would do well to inspect Michael Polanyi's PERSONAL KNOWLEDGE. Polanyi's treatment of these matters is considerably more systematic and well-documented than anything I could do here, and his conclusions are essentially the same as mine on this point. The scientist constantly reassures himself and his public that he won't believe anything until he sees it whereas, in fact, he won't see anything until he believes it. If, in science, to see is to believe, than it is at least as much the case that to believe is to see.

If we confront a scientist (or anyone else, for that matter) with that nasty little question that five-year-olds are always asking, "why?", we will inevitably drive him to the same fundamental basis of his theorizing: "Because!" Though we would always like to think there is more, the rock on which our beliefs and theories about the universe must always be founded is our own, intensely personal commitment to the perspectives, ideals, and values that we hold.

Relativistic as this stance toward the process of science may be, it is crucial to keep in mind that I in no way intend to belittle the value of scientific endeavour. Whenever one tries to argue that the foundation of what human beings believe is their belief itself - their emotional attachment and commitment - one always finds that people react by concluding that all endeavour based on such weak, personal premises is worthless. But such is not the case, at least in my view:

"It is one thing to say that 'values are only relative,' Quite another to remove the pejorative adverb and assert 'There are relative values.'"
To claim that science is worthless because it rests only on the biases and emotions of scientists is, in my estimation, to grossly misplace one's emphasis and grossly devalue the so-called "affective" aspects of human beings. The crucial, valuable thing about science, as about all human endeavour (see Chapter I), is that experience of commitment and involvement which is denied value by the statement "Values are only relative."

The value of science lies in its "Moments of Truth" as Arthur Koestler has called them. They are the "Eureka" experiences, the flashes of insight, the "great" discoveries which shake the ages and leave masses of work for technicians who wish to "prove" the validity of what the discoverer already knows. These intuitive experiences are what scientists, and human beings in general, live for. They are acts of knowledge as I have described them elsewhere, and the verbalizations of science are little more than attempts to communicate those experiences and lead others to have similar ones. Compare the following descriptions of scientists at the moment of truth, with Chapter I's descriptions and anecdotal accounts of mystical experiences. There is, I claim, no detectable difference:

Just at this time I left for Caen, where I was then living, to go on a geological excursion under the auspices of the school of mines. The changes of travel made me forget my mathematic work. Having reached Countances, we entered an omnibus to go some place or another. At the moment when I put my foot on the step the idea came to me, without anything in my former thoughts seeming to have paved the way for it, that the transformations I had used to define the Fuschian functions were identical with those of non-Euclidean geometry. I did not verify the idea; I should not have had time, as, upon taking my seat in the
omnibus, I went on with a conversation already commenced, BUT I FELT A PERFECT CERTAINTY. (Henri Poincare)

One phenomenon is certain and I can vouch for its absolute certainty: the sudden and immediate appearance of a solution at the very moment of sudden awakening. On being very abruptly awakened by an external noise, a solution long searched for appeared to me at once without the slightest instant of reflection on my part - the fact was remarkable enough to have struck me unforgettably - and in a quite different direction from any of those which I had previously tried to follow. (Jacques Hadamard)

On April 27, 1802, I gave a shout of joy...It was seven years ago I proposed to myself a problem which I have not been able to solve directly, but for which I had found by chance a solution, and knew that it was correct, without being able to prove it. The matter often returned to my mind and I had sought twenty times unsuccessfully for this solution. For some days I had carried the idea about with me continually. At last, I DO NOT KNOW HOW, I found it... (Andre Marie Ampere)

At last two days ago I succeeded, not by dint of painful effort but so to speak by the grace of God. As a sudden flash of light, the enigma was solved....For my part I am unable to name the nature of the thread which connected what I previously knew with that which made my success possible. (Karl Friedrich Gauss)

I took part in the wine harvest. I watched the wine flowing, and going back from the effect to the cause, I studied the power of this press which nothing can resist.... A simple substitution which is a ray of light....To work then! God has revealed to me the secret that I demanded of Him.... (Johannes Guttenberg)

It is in the highest degree astonishing to see what a large number of general theorems, the methodical deduction of which requires the highest powers of mathematical analysis, he (Faraday) found by a kind of intuition, with the security of instinct, without the help of a single mathematical formula. (von Helmholtz)

The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The physical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be 'voluntarily' reproduced and combined.... Taken from a psychological viewpoint, this combinatory plau
seems to be the essential feature in productive thought — before there is any connection with logical construction in words or other kinds of signs which can be communicated to others. (Albert Einstein)

'I see everywhere in the world the inevitable expression of the concept of infinity. It establishes in the depths of our hearts a belief in the supernatural. The idea of God is nothing more than one form of the idea of infinity. So long as the mystery of the infinite weighs on the human mind, so long will temples be raised to the cult of the infinite, whether God be called Brahmah, Allah, Jehovah or Jesus... The Greeks understood the mysterious power of the hidden side of things. They bequeathed to us one of the most beautiful words in our language—the word 'enthusiasm'—a god within. The grandeur of human actions is measured by the inspiration from which they spring. Happy is he who bears a god within—an ideal of beauty and who obeys it, an ideal of art, of science. All are lighted by reflection from the infinite.' (Louis Pasteur)

...I maintain that cosmic religiousness is the strongest and most noble driving force of scientific research. Only the man who can conceive the gigantic effort and above all the devotion, without which original scientific thought cannot succeed, can measure the strength of the feeling from which alone such work... can grow. What a deep belief in the intelligence of creation and what longing for understanding, even if only a meagre reflection in the revealed intelligence of this world, must have flourished in Kepler and Newton, enabling them as lonely men to unravel over years of work the mechanism of celestial mechanics....Only the man who devotes his life to such goals has a living conception of what inspired these men and gave them strength to remain steadfast in their aims in spite of countless failures. It is cosmic religiousness that bestows such strength. A contemporary has said, not unrightly, that the serious research scholar in our generally materialistic age is the only deeply religious human being. (Albert Einstein)

I must, before I die, find some means of saying the essential thing which is in me, which I have not yet said, a thing which is neither love nor hate nor pity nor scorn but the very breath of life, shining and coming from afar, which will link into human life the immensity, the frightening, wondrous and implacable forces of the non-human. (Bertrand Russell)

The most beautiful and most profound emotion we can experience is the sensation of the mystical. It is the sower of all true science. He to whom this emotion is a stranger,
who can no longer stand rapt in awe, is as good as dead. That deeply emotional conviction of the presence of a superior reasoning power, which is revealed in the incomprehensible universe, forms my idea of God. (Albert Einstein)

The sublimation of the self-transcending emotions has transformed 'magic' into 'science'; but there is no hard-and-fast boundary between the two. Unconscious, pre-rational, 'magical' thinking enters both into the creative act and into the beliefs or superstitions of the scientist... Not only Kepler's astronomy was derived from belief in the Holy Trinity and the Harmony of the Spheres; most of the giants of science were similarly inspired by religious, mystical or transcendental beliefs. (Arthur Koestler)

The verbalizations are, at best, secondary. Personal commitment, emotional attachment, and irrationality are the cornerstones of science as they are of all significant human endeavour. Indeed, I should note that Arthur Koestler in his brilliant THE ACT OF CREATION, has done an excellent job of documenting and explaining such notions for the fields of humor, the arts, and science. The creative act is the act of transcending one's self, of discarding old category schemes, of combining frames of reference (Koestler calls them 'matrices') into wholes that were previously separated artificially. Science, like all other areas of human life, is a perfectly adequate means for living in, but its value lies in personal commitment and transcendence, not in its systematic verbalization.
CHAPTER IV

Psychology first lost its soul, then its mind, then consciousness; but strangely enough, it still behaves!

In the previous chapter I have tried to persuade the reader that science ultimately rests on the personal commitment of scientists to their theories, biases, and perspectives. A large number of current scientists and philosophers of science, especially in the more "exact" sciences like quantum mechanics and high energy physics, would concur with some such description. They would agree that theories are created, not found. That man imposes order on the universe with varying degrees of satisfaction. That Scientific Laws do not spring forth full blown from the head of Data. That the essence of science and its value to both individual scientists and the world does not lie in its systematic massing of reams of facts.

But the so-called "Social Sciences", and psychology in particular, still gain their philosophical nourishment from philosophies of science which prevailed in physics at least 50 years ago, and have since long died their natural deaths. The modern day psychologist, by and large, perceives his science in the kind of naive realistic manner that the natural scientist has long since abandoned as hopeless. Consider, for example, the following quotations from B.F. Skinner's SCIENCE AND HUMAN BEHAVIOR:

Science is more than the mere description of events as they occur. It is an attempt to discover order, to show that certain events stand in lawful relations to other events. (p.6)
Science is first of all a set of attitudes. It is a disposition to deal with the facts rather than with what someone has said about them. Science is a willingness to accept facts even when they are opposed to wishes. Thoughtful men have perhaps always known that we are likely to see things as we want to see them instead of as they are, but thanks to Sigmund Freud we are today much more clearly aware of 'wishful thinking.' The opposite of wishful thinking is intellectual honesty - an extremely important possession of the successful scientist. (p.12)

Science is, of course, more than a set of attitudes. It is a search for order, for uniformities, for lawful relations among the events in nature. (p.13)

The notion of science implied by the above quotations, and all the more so by the major thrust of Behaviorism, is one which derives quite directly from Percy W. Bridgman's "operationism." In reaction to the revolution which Einstein initiated in modern physics, and in accord with the more general outlook of the logical positivists (especially Ayer and Carnap) Bridgman proposed a naively realistic philosophy of science which he believed would forever protect Science from Einsteinian catastrophe's. The essence of operationism was that all concepts mean no more than their strictly empirical descriptions:

In general, we mean by any concept nothing more than a set of operations...if we have more than one set of operations, we have more than one concept.

Operationism in the "hard" sciences died almost at the instant that it was born with scientists in a variety of fields stressing what Bridgman ignored - the total dependence of operations and concepts on theory. As Einstein wrote, in reply to Bridgman:

In order to be able to consider a logical system as physical theory it is not necessary to demand that all its assertions be independently interpreted and 'tested' 'operationally'; de facto this has never yet been achieved by any theory and cannot at all be achieved.
Why were the natural sciences so quick to reject operationism?

Because it is self-contradictory and, equally important (as Einstein reflects above) a naively inaccurate view of what scientists have done. Consider, for a moment, an operational approach to the concept "length."

How would we go about measuring a length, even approximately? We would take a yardstick and put it down next to the object measured, and see how many times we can lay it end to end - forgetting for the moment about fractions of yards. But which yardstick? There is an official meterstick in Paris, but it is very precious, and never used. What we do is measure off another stick of the same length, and use it. But how do we know that this will give us the same answer? How do we know that it makes no difference what material it is made of and by what route it is carried to the object to be measured? The answer is that we consult our theories to see whether these factors influence the length; we are told that the route traveled makes no difference, but the material it is made of may influence the measurement, for example, in very hot weather. But this is a vicious circle! We are trying to define length; in applying this definition we must apply theories which make use of the concept of length, which is yet to be defined. How do we know what the theories mean until we know what length is, and how do we know what length is until we have these theories?

To put the argument in Polanyi's terms, we need a subsidiary awareness of a whole body of theory in order to define length. And we need a subsidiary awareness of length in order to build bodies of theory which employ that concept. Operationism denied the intuition and commitment to theory upon which science rests, and so was rejected in short order.

But the behavioral sciences (with Watson taking the initiative) swallowed Bridgman hook, line, and sinker. Rejecting the much more sophisticated views toward science of psychologists like Freud (a keenly astute philosopher of science), the behaviorist tradition
gained its major foundations from a still-born philosophy of science. The rebirth of behaviorism with its empirical approach to human life; with its "search" for the laws governing human behavior; with its insistence upon behavioral definitions for such concepts as "mind" and "emotion"; and with its rejection of any meaning in such concepts unless they can be defined behaviorally amounts to little more than an attempt to revive a fictitious past. If psychology is a science, or is ever to become one, it will find its grounding in the same elements of intuition, commitment to theory, and subsidiary awareness that support other scientific endeavours.

The irony of the situation is that, although behaviorism presumes to be purely atheoretical, empirical, and "objective" it is, by human necessity, bound up in the same processes of theory-building, bias, and commitment that it renounces in other breeds of psychology. After all, how does one know what a "behavior" is except by some body of theory or conceptual structure which gives that category meaning? As I have argued elsewhere, the mere use of language constitutes a commitment to ways of dividing the world which are arbitrary but which guide our very thoughts and actions. The only psychology that could ever be free of theory, bias, and commitment would be the totally silent psychology, and behaviorism is certainly not that!

Kekule's recommendation is one which psychologists would do well to consider:

"Let us learn to dream, gentlemen!"

The psychological theories described in the following chapters are verbalizations of dreams. They represent the kind of speculation
and commitment which must ultimately become the basis of psychology in any humanly scientific form. Furthermore, they represent beginning points for accomplishing a major task which all psychologies must heed, but which few even recognize as a problem: Psychology, as a science, must be grounded in some substantial body of philosophy. But psychology deals with human beings, and human beings are the producers of both philosophy and psychology. Thus, psychological theory must account for itself and for the philosophy on which it is based.

The physicist can be content to ground his theories in contemporary philosophies of science and then proceed to follow his intuition as it leads him with no need to introspect on how that theory applies to itself, to himself, or to the philosophy on which it is based. But the psychologist's theories must do more. They must help in explaining the psychologist to himself. They must be of use in explaining how they, themselves, arose. And they must simultaneously support and be supported by a philosophy of science. To use Polanyi's framework again, an adequate psychological theory must rely on subsidiary awareness as support for its focal awareness, but it must also be able to account for that which it relies on and must even account for the subsidiary-focal relationship.

No small task, that, but it is precisely the direction in which the theories to be described attempt to move. They begin by assuming the philosophical bases which have already been discussed: science as commitment, intuition, subsidiary awareness, living-in. The theories are based on the legitimacy of personally held theory - they
derive their ultimate validity from my commitment to them, and from that of those others who share that commitment. At the same time, the theories help to explain the manners in which we slice up the world arbitrarily; the ways in which focal awareness becomes subsidiary awareness; the ways in which living in is possible as a human experience and the necessity for human beings (including me as psychological theorist) to rely on committed-to words and theories in their attempts to categorize the uncategorized.

Some more words about words seems necessary at this point. The philosophy of science I have described and the psychological theories I will describe are all founded in language, conceptual schemes, the slicing up of the "world-hologram." Yet, I am committed to that philosophy and those theories in the same manner as I am committed to the notion of an unverbalizeable world. Contradiction? Perhaps, but if so it is to be expected in a world which language can only describe arbitrarily. The theories which I propose are arbitrary and deceptive as are all verbalizations. They do, however, carry my personal conviction, plus confirmation through evidence which I will describe, plus the personal convictions of several noted psychologists. And, most importantly, they succeed in doing what few psychologies have attempted - explaining themselves.

Lest the reader get lost in the technicalities which follow, let me describe the general structure of the subsequent chapters. Chapter V proposes a theory of schizophrenia and attempts to explain thereby how mystical experiences and extreme cases of "living in" are possible. Chapter VI deals with some general and specific considerations
of human processing of sensory input. The intent here is to document the notion that human beings impose order upon the universe, even at such basic and primitive levels as visual perception. Chapter VII builds on the specifics of Chapter VI and begins to set forth a general model of "learning", where I mean by learning the development of systematic ways of categorizing, slicing-up the world. By the time he reaches Chapter VIII, the reader will find himself out of the trees and ready to see the forest, for it is at that point that I shall begin to tie both philosophical and psychological considerations explicitly to the main focus of this document: student-directed learning.
CHAPTER V

I want you to remember that in the present state of our society, the patient is right, and you are wrong.

The descriptions of the schizophrenic experience already mentioned in Chapter I, and the central place which such mystical experiences have in that chapter, make the psychology of schizophrenia an excellent jumping-off place. Most of the elements of the general learning theory to be described in Chapter VII will appear somewhere in this chapter. But my intent here is not to develop the learning theory. Rather, it is to convince the reader that a substantial body of psychology and physiology can be brought behind H.S. Sullivan's statement above. In the terms that I used in Chapter I, the schizophrenic experience is one of "living in", of feeling the world in its "real", undifferentiated state. This chapter attempts to explain how it is that such living in experiences can occur, and how it is that they frequently lead their experiencers to become what we classify as schizophrenic.

The label "schizophrenic" is usually applied in the following four categories to people who exhibit the associated behavior patterns:

(1) Simple Schizophrenic: Usually develops in the early teens and is typified by extreme apathy to the environment.

(2) Hebephrenic: Also develops early and slowly. The person exhibits very active but "absurd" behavior - unexplained laughing,
bizarre word associations, degenerate behavior (e.g. eating dirt).

(3) Paranoid: Onset is usually quite sudden in early to middle adulthood. The patient has delusions - systematized beliefs about the world not shared by the rest of humanity - and hallucinations.

(4) Catatonic: Onset is usually quite sudden. The patient is seemingly unresponsive to the world and displays unusual outbursts of behavior (e.g. attacks or assaults, or very rigid walking, curling up in a ball, etc.)

Needless to say, the kinds of behavior that will suffice to get a person labeled as officially schizophrenic differ quite widely from one another. The important question in all such cases is that of deciding between what is the Primary disorder, and what is Secondary. Is the paranoid's systematic delusion an adaptive response to some other problem, or is the delusion at the core of the problem itself? If a person limps when he has a broken leg, we quite easily classify the limp as a secondary disorder - an adaptive and sensible response to the primary disorder, a broken leg. If a person is subject to frequent catatonic fits, are the fits secondary or primary disorders? If secondary, then what are the fits a response to?

In a nutshell, the theory of schizophrenia which I wish to propose sees all of the symptoms described above as secondary, adaptive reactions to a much more basic "problem". The schizophrenic is the person who, for one reason or another, has more accurate perceptions of the "real" world than the rest of us. Perception of the world, as we "normal" people engage in it, is a complex interaction between input from the world and our own perceptual modification of that input. The
schizophrenic is one who is not able to modify the input as extensively as we do, and hence he experiences things in ways closer to "reality" than we do. The symptoms of schizophrenia are simply adaptations which the schizophrenic makes in order to cope with his more intense perceptions, and with the fact that no one besides himself seems to be experiencing those perceptions. Most of the psychology which I will explain in this and subsequent chapters is an attempt to understand what it is that we do to "reality" as it enters our perceptors that schizophrenics do not do.

Perhaps a good start would be for us to consider what it means to "pay attention" to something. What we are doing when, in a crowded, noisy room, we focus our attention on one particular voice? The most likely answer is that we are tuning everything else besides that one voice out. We pay attention to the voice by ignoring everything besides the voice. To a large extent, focusing attention is a negative, rather than a positive, matter. There is abundant psychological evidence for such a conception of attention, most of it stemming from the work of people like Moruzzi\(^2\) and French\(^3\) on the "reticular formation" (about which more later), Malmo\(^4\) on activation, and the classical learning theorists (e.g. Hull)\(^5\) on inhibition.

Most interestingly, some of the physiological mechanisms of this process of attention through selection have been worked out, and they bear directly on the problems of schizophrenics. What seems to happen is that the reticular formation (a structure in the mid-brain) serves the double role of activating the cortex as a whole (i.e. tuning it up, preparing it to receive stimuli) and at the same time damping down all
inputs except the ones to which a person is attending. It is this latter function of inhibiting incoming stimuli that is of most interest for our purposes. The nerve mechanisms whereby this kind of inhibition occurs have also been studied to some extent, and also provide some helpful clues to the world of the schizophrenic. Most of the nerve fibers which inhibit input are "cholinergic" - a particular class of autonomic nerves which gets its name from one of the chemicals involved in the transmission of nerve impulses from one nerve to another. When a cholinergic nerve "fires", the impulse is in part transmitted by the chemical acetylcholine, secreted well in excess of what is necessary to trigger the next nerve in line. But once the nerve has fired, two other chemicals are released (cholinesterase and serotonin) to absorb the extra acetylcholine and thus return the first nerve to normalcy. If the cholinesterase and serotonin were not there, the cholinergic nerves would have a much lower threshold than they usually do - i.e. they would fire with much less prodding. If an excess of either cholinesterase or serotonin exists, the nerves will have a much higher threshold - i.e. it will take much more prodding to fire them.

Now, what seems to be happening in "normal" human beings is that a certain range of incoming stimuli from the world is sufficiently strong to register with our sense organs, but not sufficiently strong to activate the cholinergic-inhibitory system. These are the stimuli that we are paying attention to at any given point in time. But, at the same time, in most human beings the threshold of the nerves in the inhibitory system of the reticular formation is sufficiently low
(i.e. we have little enough cholinesterase and serotonin) that we are able to block out a good deal of the incoming world. Our screening system, if you will, is sufficiently sensitive to prevent a large part of the world from even registering our attentions, thus enabling us to deal with the world systematically, a piece at a time. What, then, given this maze of chemicals and nerve systems involved in attention through selection, might be different about the schizophrenic? The strongest possibility, backed by several lines of research, seems to be that the schizophrenic is troubled by an abnormality in his use or production of serotonin. In particular, the schizophrenic in early stages seems to have a relative abundance of serotonin at his cholinergic nerve sites, hence the threshold of his inhibition system is high, hence he is relatively incapable of screening out sensory inputs from the world.

The evidence for this fairly specific hypothesis comes from all sorts of scattered places and levels, and it would take volumes to reproduce it all here, but some of it can be stated at least in general terms. Several physiologists have attempted to make assays of the relative amounts of serotonin in normal people as compared with schizophrenics (a mightily difficult procedure). Though this work is far from conclusive due to its complexity, the evidence of such researchers as Toderick, Wooley-Shaw, and Marazzi would suggest that schizophrenics may, in fact, have an excess of serotonin at their cholinergic nerve sites.
Another block of evidence for the hypothesis comes from the extensive psychological and physiological work which has been performed using LSD (lysergic acid diethylamide). Psychologically, LSD produces perceptions and behaviors which are very closely parallel to schizophrenia. In particular, the hallucinations, the feelings of being bombarded by extra-intense sensory input which is not systematized and controlled as it normally is, and even the strange behavior patterns are closely parallel to those of schizophrenics in the early stages of the "disease." Physiologically, the effects of LSD, though still subject to much conjecture, may be even more relevant. The best current guess (again based on the work of people like Wooley-Shaw, Zeller, and Ditman) is that LSD performs the same function at cholinergic nerve sites as serotonin - i.e. it absorbs excess acetylcholine, thereby raising the threshold of cholinergic nerves and interfering with a person's ability to screen out sensory inputs. LSD, by blocking the activity of cholinergic nerves, by preventing a person from screening out sensory inputs that he "normally" screens out, produces many of the characteristics of acute schizophrenia.

The third block of evidence comes from a wide variety of sources focused on the process of learning, reinforcement, and inhibition, particularly as those processes are related to the reticular formation of the brain. The evidence here is far more extensive and complicated than in other areas, but is basically just an extension of the notion of attention as inhibition of the unwanted. Beginning with learning theories like that of Hull and with investigations of arousal and activation, one can build an argument about learning as a process of
inhibiting "incorrect" responses, just as we are looking at attention as inhibition of unwanted stimuli. With learning viewed in this light, we would predict that a schizophrenic, or a normal person or animal whose cholinergic activity has been blocked by administration of a drug, would have greater difficulty in simple learning experiments than a "normal" person. With his cholinergic activity blocked, the person would be unable to inhibit incorrect responses and would tend to continue making errors because he was not able to block them. Evidence that such is, in fact, the case has been obtained by Hearst, Carleton, Krech and Rosenzweig in studies of the effects of drugs and cholinergic activity upon animal learning and by people like Howe, Venables, and Wing in studies of schizophrenics.

Before summarizing all of these disparate findings into a total picture of the schizophrenic experience, I must turn to one other aspect of the whole problem. In addition to the four classifications of a schizophrenic behavior described at the beginning of this chapter, there is a fundamental distinction between "acute" and "chronic" schizophrenics. The acute schizophrenic is the patient in the early stages of the "disease", whose perceptions and behavior have become strange, and who may therefore have been committed to an institution. The chronic schizophrenic is the patient who has spent many years in an institution and whose behavior has long since settled into some unusual rut - usually characterized by extreme inactivity and unresponsiveness. Acute schizophrenics who are committed to institutions frequently (though not always) become chronic as the years go by. Some acute schizophrenics (about 20 per cent - a figure which has not
changed since about 1920, despite all the varied efforts to design
treatments and therapies) return to normalcy at some point. All
chronic schizophrenics were at some point in the early stages of the
"disease" in the acute stage.

The distinction between acute and chronic has considerably more
significance for the theory of schizophrenia that I am proposing than
do the four categories mentioned earlier. The four categories
represent, to me, different behavior patterns which schizophrenics
adopt in order to live with and explain to themselves their unusual
perceptions. The acute-chronic distinction, however, has a fairly
substantial physiological meaning. The acute schizophrenic is the one
who is bombarded by sensory input because his screening mechanisms
are not functioning — i.e, his cholinergic nerve activity is hampered.
This means two things in the light of the double function of the
reticular system: (1) the acute schizophrenic does not screen inputs
very effectively and is hence bombarded by his environment; (2) the
acute schizophrenic is at a relatively low level of arousal or
activation due to a low level of reticular stimulation of the cortex
in general.

The chronic schizophrenic, on the other hand, is physiologically
quite the opposite. His level of arousal and activation is abnormally
high and his screening activity is exceptionally effective. Thus,
whereas the acute schizophrenic does not screen out as much input as
we do, the chronic screens out far more than we do. These extreme
differences in the physiology of acutes and chronics have been fairly
well documented by such researchers as Shagass and Hall, and are.
exceptionally well illustrated by the different reactions of acutes and chronics to administration of small doses of tranquilizers. If such drugs are administered to acute schizophrenics, their symptoms and abnormalities are greatly worsened. But if administered to chronic schizophrenics, even though they are outwardly very passive, the tranquilizers lead to some improvement and lessening of abnormalities.

What seems to be happening when tranquilizers are given to the two groups? When administered to acutes, the drugs increase the problem by lowering an already low level of arousal and by further hampering the patient's ability to screen out environmental input. But when given to chronics, the drugs lower a level of arousal which is too high, and prevent the patient from screening out as much as he does, thus bringing him closer to the levels of arousal and "screening" that we typically are at.

The general picture of schizophrenia which emerges from the preceding discussion is somewhat as follows. For reasons yet to be determined, some people develop a physiological problem involving their use or production of serotonin. This problem results in their being at relatively low levels of arousal (and hence, easily aroused) and makes them unable to screen out the sensory inputs which they have been screening out all their lives. They begin to experience sensations which the people around them are not experiencing (see THE INNER WORLD OF MENTAL ILLNESS) - brighter colors, louder sounds, generally unsystematized and uncategorized perceptions. Since no one else is having these experiences, and since they, themselves, have never had
them before, they begin to develop rationalizations of their new sensations and behavior patterns that will help them cope with them. They might believe that they are being persecuted by "someone" or everyone, or that they have been singled out as special by God (Paranoid)... They might find the sensations too much to bear and consciously tune out their environment through extreme apathy (simple). They might simply "flow" with their new sensations and thus exhibit behavior which is strange to the rest of us - e.g. laughing for no good (to us) reason, strange word associations (hebephrenic). They might exhibit extremely violent bursts of behavior due to their excitability or might adopt a rigid posture, including very slow walking, in order to prevent their kaleidoscopic sensations from becoming overwhelming by their changing so quickly (catatonic).

In any case, the behaviors which we focus on to categorize them as "sick" are quite natural reactions to a rather drastic change in their perceptual world. They feel like they are "made of hollow glass" because of their extremely intense sensory experiences, and they cope with those experiences in ways that we find to be unusual. So we commit them to an institution which by virtue of its being intensely stimulus free, helps them to shift from the acute stage to the chronic stage. Thus, with sensations coming in at a rapid and uncontrolled rate, they adopt the defense of trying to shut out as much of the incoming world as they possibly can so that they can cope with their world. And we help them shut the world out by placing them in institutions that do a lot of the shutting out for them (e.g. plain white rooms). Slowly, the acutes become chronic as their state of
arousal increases and they are able to shut out more and more of the external world. Finally, they and we, have succeeded in shutting out so much that they are faced with a new problem, in a new inner world, that they are rarely, if ever, able to escape from—hallucinations.

Whereas the acute schizophrenic is placed in the difficult position of dealing with genuine, but very new and intense, sensations, the chronic schizophrenic is faced with a world of hallucinations that are quite literally produced from within. The hallucinatory world of the chronic is undoubtedly quite similar to (and arises for the same reasons as) the well-documented hallucinatory world of people participating in sensory deprivation experiments. In conditions where sensory input is severely limited, human beings seem to fill their minds with assortments of material stored over the years in their brains. Thus, the sleeping person dreams; the person in a sensory deprivation chamber hallucinates; and the chronic schizophrenic is confined (by himself and a mental institution) to a hallucinatory world.

This description of schizophrenia bears quite directly on much of the philosophy which I have already propounded and on much of the psychology which is soon to be discussed. I am claiming that, just as the descriptions of schizophrenic experience may describe the world in a more "real" manner that our schematized descriptions, so there is a sizeable body of psychological evidence which helps account for the difference between normal and schizophrenic perceptions. In particular, the evidence does indicate that the acute schizophrenic's perceptions are more real than ours in the sense that they are more complete, less
actively screened and modified by the perceiver. It is only through our labeling of the schizophrenic as mentally "sick", and through the schizophrenic's own sense of strangeness, inadequacy, and disease, that the acute, who lives in the world more fully than we, comes to defend himself by closing out the world and creating his own hallucinatory version of reality - i.e., becomes a chronic schizophrenic, usually for the rest of his life.

Furthermore, we have begun to discuss the ways in which we, by contrast with the acute schizophrenic, process and screen the information which comes to our senses from the world. We have, thus far, looked briefly at one of the mechanisms (the reticular formation) whereby we actively block out sensory input and prevent it from registering on our minds. It is to a more detailed consideration of these processes of sensory control, modification, and screening that I wish now to turn. The schizophrenic, as I have described him, is the person who is particularly able to head Camus' dictum:

Open yourself to the benign indifference of the universe
Let us inspect the ways in which we close ourselves, keep the world out, and fail to "live in".
Most of us regard the eye as one of the most passive receptors which we possess. To be sure, we are aware that the eye does not pick up all the frequencies of light that surround us, but we tend to believe that what our eyes do see arrives at our brains in fairly undistorted fashion. We consider the eye to be a window to the world, letting what is out there come in so that we may behold it.

Until recently, psychology has, in fact, regarded virtually all sensory perception in some such light. The old theories of the "reflex arc" and of stimulus-response psychology in general were predicated on the belief that the nervous system (excluding the brain) serves two separate functions: letting pure information in, and activating muscles. Until recently, the afferent (carrying messages to the brain) and efferent (carrying messages from the brain) nervous systems were thought to be quite separate except for their connections at the brain and spinal column.

Recent work in neurophysiology has pretty much destroyed these notions. Experiments involving virtually every mode of sense perception have demonstrated that the afferent-efferent distinction is not as clean as we liked to believe. What has been found, in general, is that some 10-30 per cent of our afferent nerve fibers carry messages to the sense organs, thereby exerting active control over what is perceived.
and how it is perceived. General statements of and evidence regarding this view can be found in the work of such people as Kuffler, Hunt, Hagbarth, Kerr, Galambos, Pribram, Spinelli, Sperry, and Weiss.

I wish, in this chapter, to deal with the more specific problem of afferent control of perception in the eye as a model of such control in all other perceptors and as a model of the process of learning (see Chapter VII). The eye is, after all, an ideal case for study since the retina is little more than a group of migrated brain cells: in this sense, at least, the eye is a window to the brain.

First, a few words must be said about the structure of the retina. Rather than being a single layer of rods and cones which are sensitive to light, the retina consists of at least four layers of nerve cells, the last of which (i.e., farthest from the entering light) is made up of the light-sensitive rods and cones. The other three layers (amacrines, bipolars, and ganglion cells) are highly relevant to the following discussions for they appear to be the ones that play an active part in interpreting, coding, and distorting information before it is passed on to the brain. The messages that are sent from the eye to the brain are not "pure" reflections from light sensitive cells, but interpreted, coded versions of that input.

One of the ways in which the retinal cells code visual information is through what is known as "lateral inhibition" - probably a function of the amacrine cells. The physiological and behavioral aspects of lateral inhibition have been investigated fairly thoroughly for the senses of sight, hearing, and touch by such researchers as Hartline, Hubel, Ratliff, and Eccles. In the case of the eye, what seems to
happen is that the activity of a rod or cone inhibits the activity of its neighbors. Thus, when a receptor fires due to light shining on it, it depresses the firing of its neighbors. The stronger the light, and the closer the neighbor, the stronger the effect of the inhibition. This effect of each rod and cone on its neighbors seems to be achieved through the amacrine cells which laterally connect the receptors with one another.

The effects of lateral inhibition on information coming into the eye are crucial both to our ability to perceive and to my discussion. The mutual inhibition of neighbor by neighbor serves to increase the amount of contrast in the visual material entering the eye. And a striking example of the way in which contrast is increased by lateral inhibition is found in the phenomenon called "Mach Bands" named after the physicist Ernst Mach who first investigated them extensively. If a human being looks at a piece of paper which is graded smoothly and continuously from light to dark, he will not see the gradation as perfectly continuous. Rather, he will see a light band in the light area and a dark band in the dark area so that the change in darkness appears to be "bumpy" rather than smooth. These light and dark bands, which are produced by the observer's eye through lateral inhibition, are Mach Bands. It is literally impossible for a human being not to see Mach Bands, and yet they are not "really" there - they are produced by the retina. Furthermore, it is the same mechanism which produces Mach Bands that enables us to perceive contrast at all. Were it not for lateral inhibition we would not be able to perceive the contrasts (bright-dark, loud-soft, hard-soft) that we "find" in the outside world.
In addition to lateral inhibition which helps us perceive contrast, there are other things going on in the retina which also alter the visual information coming in from the outside. One of these phenomena is known as adaptation or "self-inhibition" and is typified by the obvious processes of "getting used to" a dark room or colored sunglasses. Until very recently it was thought that adaptation was merely related to bleaching of pigments in the rods and cones (receptors) of the retina. But recent work involving Electro-Retinograms, and an interesting experiment by Ratleff indicate that such is not the case. Ratleff's experiments involved the production of a stabilized image on the subject's retina through the use of mirrors (including one mounted on the white part of the eye) and an electronic device which corrects for eye movements. The apparatus causes a slit of light to be shined into the eye such that it continues to fall on the same receptors, regardless of the person's eye movements. With the light always falling on the same rods and cones, it is perceived accurately for a few seconds, but then it disappears. After a few seconds, the person no longer sees the light at all.

What seems to happen is that the bipolar cells of the retina act as a feedback loop and if the light on a given receptor cell is not changing, it is erased within a few seconds. This phenomenon of "self-inhibition" is, once again, not isolated to the sense of sight. If, for example, the reader will place the eraser of a pencil on the back of his hand and hold it perfectly still, he will find that after a few seconds he can no longer feel its presence. The sense receptors respond to the change (a new light or a pencil on the back of the hand) but
then, unless things change again, they erase themselves and are thus prepared for whatever else might come their way.

Let us stop here and build a somewhat abstract model of perception which builds on and extrapolates these notions of lateral and self inhibition. Sensory information from "outside" is coded into some sort of message through the process of lateral inhibition. The information is, in a sense, stereotyped by this process - contrasts are exaggerated and "distinguishing" features are highlighted so that the input may be coded (categorized) and passed along the line. The receptor is then erased by the process of self-inhibition so that it is ready to process the next input that comes along. As we proceed up the neural hierarchy, these same two processes continue to operate, all the way up to the cortex. That is, each stage adds further coding, categorizing, and processing and then erases itself to await new input. Further evidence seems to indicate that the ways in which the incoming information is coded depends on a whole life-time of active experiences, and it is to this evidence that I now wish to turn.

The evidence begins with a simple experiment first described by Helmholtz which the reader could perform on himself. Close one eye, and then with your fingers push the other eye around. What you will see is that the whole perceptual field seems to bounce around - i.e. to move in the direction that you move your eyeball. But if you were to move your eye in the same way with your eye muscles (rather than your finger) the world would not appear to be moving. And yet the pattern of light which falls on the retina in the two cases is exactly the same!

The traditional explanation of this phenomenon is one that employs
an analogy and we shall start with it in the hopes that the analogy can be made a bit more concrete. Consider the eye as a projector and the retina (or, perhaps, the visual cortex) as a screen on which images can be shown. Normally, when we move our eyes with our eye muscles, we simultaneously "move" the screen so that the world does not appear to move. In the above experiment, the projector is moved, but the screen is not, hence the sensation of the world bouncing around. Landsteiner added a good deal of credence to this analogy by performing the converse experiment upon himself — moving the screen without moving the eye. He paralyzed (temporarily) his eye muscles and then tried to move his eyes. Obviously, his eyes did not move, but the world appeared to move around — i.e. he moved the screen without moving the projector.

Further evidence indicates that, in order for a person to construct such a "screen" which moves in harmony with one's projector, one must be active rather than merely passive in receiving stimuli. Several experiments have been performed wherein the subject wears prism glasses which flip his visual world upside down. If the subject is allowed to move around and be active, the world flips itself back to right-side-up within two weeks — i.e. the screen turns itself upside down to match the projector. Similarly, Richard Held has performed experiments on kittens wherein some of them walk under their own power and others are pulled in a gondola, but all are exposed for the same length of time to the same visual patterns. The active cats learned to discriminate the patterns, the passive ones did not.

Teuber, Pribram, and Bruner have referred to this process of
"preparing the screen" as corollary discharge or, more popularly, a "feed-forward-mechanism." The basic notion is that when we are about to perceive through a particular sensory mode, we pre-set the perceptual process in anticipation of the perceptions. Our perceptions and actions then change the "screen" on which our next perceptions will be seen and we prepare the new screen for the next round of perceptions. Needless to say, this analogizing is somewhat speculative, but the experiments cited above plus some of the work of Pribram on the visual cortex of the monkey do suggest that some such feed-forward-mechanism, influenced by past actions, is crucial to the way in which we perceive. The juicy question is, of course, what is the "screen" on which our perceptions are seen and which is pre-set to accommodate all our incoming sensory data?

For a possible answer let us return to my original description of holographic photography. The combination of a reference beam of light and light bouncing from objects produces interference patterns on a photographic plate. These interference patterns can then be illuminated so as to reproduce a three-dimensional picture of the object. The picture produced is the same regardless of how small or large a piece of the hologram is illuminated. Interestingly enough, there is mounting evidence that the sensory processes of the human being as I have been describing them in this chapter operate in much the same way as a hologram.

Jacques Loeb and Lashley have suggested that interference patterns in the brain account for perceptions. Bearle, Gray Walter, and Lilley have produced evidence that interference patterns do exist and can be
shown by proper tapping of cortical activity. And Norton and Galambos have produced a piece of evidence which makes the hologram analogy seem well worth pursuing: they have found that removal of up to 98 per cent of a cat's optic nerve fibers does not interfere with the cat's ability to perform at pattern discrimination tasks.

With so much for accumulated bits and pieces of evidence, let me try to describe in broad outline the model of perception-screening that emerges from a consideration of the hologram analogy. At any particular "level" of the perceptual process, from retina to visual cortex, the process of lateral inhibition serves to accentuate and abstract incoming information, coding it into a more "usable" (and less accurate) form, then passing it on to the next level and wiping itself clean (self inhibition) to receive the next input. Furthermore, at each level of the process the incoming nerve impulses interact with the entire sum of spontaneous nerve activity that is already going on. Thus, the incoming data is comparable to the "object beam" in holography, and the existing neural activity is what we have called the "screen" - the "reference beam" in holography. Every perception, then, is an interference pattern produced by the combination of large-scale neural "waves" from outside and inside.

Thus, for example, at the retina, interference patterns are formed by the nerve activity stimulated by incoming light mixing with the "reference beam" (i.e. the sum of perceptions stored up until that time). This interference pattern is passed on to the visual cortex thus changing the screen (reference beam) and the retina is then prepared for new input (i.e. the new version of the screen, modified by the last per-
ception, is fed forward to serve as the reference beam for the next input). The "screen" we have been talking about is the "reference beam" and it is constantly being changed since it is no more than the "sum" of all the effects of neural interference patterns which a person has experienced.

How is the "screen" stored? That is, how do the effects of all our perceptions come to have a more-or-less permanent effect on our mode of perception in the future? This is not the place to go into the physiology of memory (for the reader who is interested, D.P. Kimble's THE ANATOMY OF MEMORY is an interesting start). But the recent work of Hyden, Krech, Rosenzweig, Bennett, Diamond, and Pribram would suggest that the two factors of RNA-induced protein formation and actual growth of nerve fibers are involved in both rewiring and changing the "resistance" of neural pathways. These two processes could account for changes in the entire cortical circuit being produced by new sensations (i.e. interference patterns) - and the changes in the circuit would, in effect, be what we call "memory". That is, each perception influences the ways in which future experiences will be had by changing the cortical circuit. The degree of permanence in that change is the degree of permanence of the memory of the perception.

My concern, however, is not closely related to memory and its physiology, a subject which has relevance in its own light. Whatever theory of memory turns out to be most popular, and however many "stages" it has between short- and long-term, it will, in my terms, be accounting for the way in which incoming perceptions influence future perceptions. I have tried, in this chapter, to show the many ways in which incoming
perceptions are modified by our past experiences, stored as they are in the neural patterns of our brains. Every experience we have is coded, even at such primitive levels as the retina. The information which reaches our "minds" is not "the same" as that which impinged on our eyeballs. It is abstracted, categorized and filtered in ways that we are never conscious of but which are part of our very physiology.

Furthermore, every such categorized perception influences the way in which future perceptions will be categorized. By the time a person has reached my age (and, indeed, well before) he has, in effect, built into his head an entire world of categories and systems which filter, screen, and abstract his perceptions into familiar boxes. The perceptions "themselves" do not come wrapped tightly by Nature in such boxes, but we develop the boxes ourselves, in our heads. I have claimed that these filtering and screening mechanisms operate at all levels of the neural process, and I wish now to turn to a higher level: that of "learning" in general. I will mean by "learning" the development of categories, systems, schemes for relating perceptions and experiences to one another, and I will develop a model which is based, in its mechanics, on the processes that we have already seen: lateral and self inhibition. In essence, it is a model which describes the way in which we build the "screen" on which all of our perceptions are "shown." Thus, it is a model of the way in which we see what we believe, rather than believing what we see,
CHAPTER VII

The ancient subject matter of psychology - the mind and its various manifestations - is distressingly invisible, and a science with invisible content is likely to become an invisible science.

The model of learning which forms the basis of this chapter is little more than an extrapolation of the notions set forth in Chapter VI. I am concerned here with what the "screen" is on which all our experiences and perceptions are based, and I am concerned with the ways in which the screen gets changed by our experiences. To put it as briefly as possible, I will argue that human beings, throughout the course of their lives, develop internal representations of their personal universes. They will, if you wish, build internal models, maps, pictures of what the world is like. These maps (the screens I have been talking about) then provide the framework within which all of their experiences occur. Learning as we traditionally view it (i.e. new concepts, theories, facts, etc.) is nothing more than the process of adding to, subtracting from, or changing one's internal map of the universe. "Living in" as I have described it is the experience that one has when his perceptions are not filtered, channeled, and explained by his internal map.

But let me use a simple example to become more clear about what an internal "map" is. When you first move to a new town, it is virtually impossible to navigate without some form of external aid. To get from your house to your office and back you will have to rely on a
city map, written directions, or possibly a memorized set of instructions giving you street names, landmarks, distances, and the proper turns in their proper places. After a while, of course, you no longer need to rely on anything external. You know where to turn, and all the landmarks that signal places to turn, slow down, avoid bumps, watch for traffic, etc., are virtually automatic for you. In my terms, you have internalized a "map" of the route from home to work and back. I certainly do not claim that this "map" is anything like a road map. Rather, it is a very detailed representation of your perceptions as you drive from home to work. The more frequently you drive the same route, the more familiar it becomes - the more of its detail do you incorporate into your mental picture of the universe. Most importantly, your internal representation of that route from home to work is your expectation of what you will perceive next time you drive. It is, if you will, the detailed screen on which your future perceptions are based. Usually, this creates no "problems" - the route is always the same as your internal picture says it should be. But, occasionally, the internal map's predictions are wrong. One day you drive the route (or, better still, go back to visit an old, familiar place that you haven't seen for quite a while) and you "feel" that something is funny, but you can't quite put your finger on it. Your attention is riveted to some part of what there is to see, and you keep staring at it without quite knowing why. And then you realize it: that house used to be grey, not green; or that fence has just been painted; or a tree that used to be there was cut down,... After the route has become very familiar, we expect it to be the way our internal map says it is, and
if it is different in the slightest detail, we pay attention to that slight difference.

I begin, then, with the notion that people build internal models of the world — that these models dictate what people perceive while at the same time being changed by what people perceive — and that these models are a guide and framework for action. The problem of a really comprehensive psychology would be to "describe how actions are controlled by an organism's internal representation of its universe" as Miller, Galanter, and Pribram have begun to try to do.¹ The problem of concern to me here is a more detailed analysis of those internal representations and how they get built.

The most helpful evidence regarding the general nature of our internal maps and the general mechanism we have for changing them comes from the work of recent Russian psychologists (particularly Sokolov) on the "orienting response".² The orienting response itself is nothing new to psychology, having been first pointed out by Pavlov³ and experimented with extensively since then. The orienting response is basically a "startle" response. It is a reaction to novelty, surprise, and involves turning toward the unexpected stimulus plus a whole range of physiological reactions (changes in heart rate, pupil dilation, skin conductance, etc.) which signal that an organism is "paying attention" (as in Chapter V - high level of arousal and much input being screened out).

The work of Sokolov in the late 1950's provides the key to learning as changes in the internal map. Sokolov placed dogs in a room, allowed them to get accustomed to it, and then introduced a new
stimulus (e.g. a tone). The dogs would, as expected, orient to the tone. Upon repeated presentation of the tone, the dogs would no longer orient to it — again, an expected and thoroughly documented process (known as "habituation"). Sokolov then found that if he changed the tone in any way, the dogs would orient to it again, until it was repeated several times in its "new" form, when they would habituate again. If the tone were made louder or softer, higher or lower, the dogs would orient to it again. If the tone were made shorter in duration (e.g. 1/2 second instead of one second) the dogs would orient to the unanticipated silence.

This final experiment, orienting toward unexpected silence, brings to mind a story which might well fix the "orienting response" in the reader's mind. Several years ago, the city of New York was forced to stop running its 63rd Street "L" (trains on suspended tracks) in order to do some work on the tracks. During the two weeks that the trains were not running, the police station received a large number of phone calls at 2 a.m. and 3 a.m. from the neighborhood in which the trains normally run. The callers would complain of burglars, but burglars were never to be found and nothing was ever missing. People would call in and claim to have been awakened in the middle of the night by unusual sounds. They could never describe the sounds, or even recall hearing them, but they had been awakened from a sound sleep by something. What was happening was that the 63rd Street L, which had become part of these people's internal map, part of their expectations of what happens every night at 2 a.m. and 3 a.m., was not there. Their waking up in the middle of the night was an orienting response to the unexpected silence.
caused by the absence of a train that was normally there. The "63rd Street L effect" was merely a powerful example of the orienting response.

The two processes described above - orienting and habituation - represent the core of learning. When there is a discrepancy between a person's internal representation of the world and the world as he perceives it, the person orient toward the source of that discrepancy - i.e. he pays attention to it. Having "registered" the anomaly for a sufficient period of time, he has succeeded in building it into his internal map, and hence he no longer pays attention to it - the "novel" is no longer "novel" - habituation (learning) has occurred.

The most lucid and economical model of what seems to be going on in the orienting response and habituation derives from the work of Miller, Galanter, and Pribram in their general attempt to relate cognition and behavior. The model is based on a hierarchy of what they call "TOTE's":

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  Test                          Exit
                   /             \
               Operate         
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To oversimplify their conception a bit, what happens is that perceptual data enter the "mind" and are immediately tested against predictions from a person's cognitive map. If the entering information is consistent with those predictions, then no difficulties are encountered and the organism proceeds on to its next activity or to the processing of the next bit of information from the world. But if there
is a discrepancy between the input and expectations, if the "Test" reveals an incongruity, then the organism performs some "operations" to remove the incongruity. When the Test stage finally reveals the successful handling of the difficulty, the organism can move on to other matters.

These TOTE's are analogous to thermostats which test the temperature in a room and, if they find it different than their setting would "expect", perform some operation (turn a heater on or off) until the difference is rectified. The orienting response as a model for learning suggests that such thermostats exist in a hierarchical manner (i.e. with thermostats regulating other thermostats) from perceptual organs all through the cortex. The settings and changes in settings on the thermostats (the "test" phase of a TOTE) are learning as I have defined it - changes in a person's internal representation of the world.

The picture of learning which emerges from these considerations is one which fits nicely with both the ontology developed earlier and the theories of perception discussed in the last chapter. It is a picture of human beings developing their capacity for imposing structure and order on a chaotic world by building structured screening apparatus. Our perceptions are comparisons of the world as it comes in through our filters with a stored accumulation of categories and expectations. When the two fail to mesh, we begin to change our screening mechanisms slightly, so that the new and unexpected becomes "familiar" in the sense that it "fits" a perceptual box which we have made for it.

The conception of a cognitive map as the "screen" on which our experiences are shown - as filter of our experiences and at the same
time subject to change due to experience - can be illuminated in somewhat greater detail by referring once again to the work of Miller, Galanter and Pribram. In conjunction with their "TOTE" model, they posit the existence of two different kinds of structures within our cognitive maps, "Plans" and "Images". "A Plan is any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed." "The Image is all the accumulated, organized knowledge that the organism has about itself and its world." Thus, the "operate" boxes in our TOTE's are primarily built up of Plans, and the "test" boxes are made of Images. The world, as it comes in through our screening processes, is constantly compared with Images - values, goals, facts, theories of the universe - which define our expectations of what the world ought to be. Our Plans summarize the ways in which we can deal with that input, be it consistent with our expectations or incongruous.

Perhaps some examples of Plans, Images, and their inter-relationships would be useful. A football quarterback has, in his repertoire, a whole series of executable Plans that he can call on at will. The Plans range in complexity from such simple things as standing, walking, and running to more complex sequences like a particular hand-off to a halfback or a series of fakes and a long pass. The Plans have been learned - i.e. built into the map as sequences that the quarterback can execute if he decides to - but the decision as to which Plan comes into play when is made with reference to Images. The Images, too, differ in their complexity. They range from simple "fact"-Images involving the quarterback's knowledge of the shape and feel of a foot-
ball, his perception of the line-markers on the field, colors on his teammates' jerseys, etc. to much more complex "value"-images. These latter, which range in complexity from the value of "winning this game" to that of "completing this pass play for a first down" or "leading the league in pass completions this year so I'll be worth more next year", form the complex web around which decisions will be made. On the basis of the information coming in from the world and the incongruities which that information creates in comparison with the quarterback's entire set of Images, he will decide at each point in the game what plans to execute at what time. The process is, of course, an exceedingly complex one, with Plans and Images hierarchically organized in terms of their importance and dependance on one another. Some of the Plans are consciously decided upon (e.g. a pass play now instead of a run) and some are automatically called upon to facilitate others (e.g. receiving the ball from center and fading back to pass). Similarly, some of the Images are consciously referred to (e.g. which is more important the first down now or the chance at a touchdown via a long pass?) and others are referred to automatically (e.g. the players on my team wear white jerseys).

Complex though these considerations may be, it would appear that virtually all of human behavior can be accounted for in terms of such a scheme. Furthermore, there are some general principles regarding Plans and Images which ease the task of accounting for learning and behavior. First, Images change only when there is either a discrepancy between Images and the input from the world or between more than one Image. If one of the quarterback's teammates is wearing a black jersey,
or if the official rules of the game are changed, or if the field conditions are unusual, this input from the outside will modify the quarterback's Images. Or, if some of the quarterback's Images conflict with one another — e.g., the value of winning the game dictates one Plan but that of leading the league in pass completions dictates another — then the Images and their hierarchical arrangement will change to remove the conflict.

Second, the execution of Plans is always subservient to some Image or set of Images. The quarterback's Images of what the world is like will always dictate the way in which his actions are called upon, and his value-Images will always dictate which Plans are called upon at what times. Furthermore, Images dictate the ways in which new Plans will be learned. If the quarterback possesses a repertoire of skills which is more than sufficient to attain all of his Images — i.e., to meet all of his goals and live in a world free of incongruities — then he has no motivation to learn new Plans. But if some of his value-Images are unattainable due to lack of sufficient Plans, or if some of his fact-Images continually raise incongruities that he cannot handle, then he is motivated to learn new Plans (and/or change his Images) so as to live in a more predictable world. As was suggested by our discussion of the orienting response, learning only occurs when something goes wrong — when the world is not as it was expected to be, or when plans are not successful in reaching the goals that we wish to reach.

The general model of learning which I have been describing in this chapter relates closely to the work of several psychologists in a host of different areas. Needless to say, none of them accept the philoso-
phical position from which I begin, but all of them are working on models of learning which focus on the ways in which information coming from the outside is coded, changed, stored, and made part of some internal representation of the world. The extensive developmental work of Jean Piaget and, more recently, of Jerome Bruner is a good case in point. Though their philosophy is basically that of the realist, their psychological work is an attempt to discover the ways in which a child's view of the world changes over the years. They, as I, realize that the way in which the child actually experiences his world changes radically over the course of his life and that the key to learning is an investigation of the ways in which experience changes the child's mode of experiencing. Readers interested in some fascinating discussions of the ways in which children come to see the world as a collection of objects, to give but one example, would do well to consult the works of Piaget and Bruner.

Similarly, the work of a great number of what are currently called "cognitive" psychologists bears directly on the model of learning proposed here. From the initial ideas of Tolman to George Miller's work on information processing to the computer simulation work of Newell, Shaw and Simon - virtually all of the current cognitive psychologists are concerned with the ways in which a person's internal map of the world is built and with the ways in which that map affects the person's perception of the world and behavior in the world. I have no desire to catalogue here the developments of these men, for I wish to move on to a discussion of the relationship between the philosophy and psychology already discussed.
Before proceeding to head out of the trees and look for the forest again, one other perspective must be considered - that of Arthur Koestler in his brilliant THE ACT OF CREATION. Koestler mounts a convincing argument that creativity, whether in humor, the arts, or the sciences, always involves the bringing together of two perspectives (matrices as he calls them) within a single human mind that have not been combined before. To catalogue examples of this phenomenon would be merely to reproduce Koestler's book, but perhaps a couple instances would be useful. Consider the following joke (taken from Koestler's multitudinous, if sometimes strained, examples):

A man and his bald boss, having just finished lunch, step outside the tavern on their way back to the office. A passing bird deposits its droppings on the bald man's shiny crown, leaving his subordinate in much dismay.

"Heavens!" (or some such exclamation) he declares, "can I do something for you? Perhaps I should get some tissue paper?"

"Hell no," replies the boss, "the bird must be a mile away by now."

The humor (creativity) in the joke lies in the fact that, up until the punch line, we have been considering the tissue paper from one perspective (a means of cleaning the boss' head) whereas the punch line forces a completely different (though not, in itself, unfamiliar) perspective on the use of the tissue paper. It is the simultaneity of the two perspectives, not typically brought together, which provides the essence of creativity.

In science, this process is, if anything, even more apparent. The creativity of Fleming in his discovery of penicillin resided in his bringing a different perspective (the possibility of curing disease by
destroying bacteria) to a very familiar event (mold in a culture jar) which had always been seen from quite a different perspective (a huge annoyance to those trying to culture bacteria). The creativity of Newton can be found in his combination of two, until that time, widely separate perspectives - that of falling bodies on the earth and of orbiting bodies in the heavens. The examples could be expanded ad infinitum, and the reader is encouraged to return to Chapter III's scientific examples from the perspective of creativity as a process of combining previously disparate perspectives.

In terms of both the psychology and the philosophy which I have been discussing, Koestler's view of creativity makes eminent sense. Psychologically, the combining of separate perspectives is, in my terms, a process of bringing together parts of a person's cognitive map that had previously been quite separate. It is the process of calling to mind, simultaneously, two or more Images which had not been considered together (and which may have been thought to be contradictory) and of producing a new Image which combines the two. It is the process of changing one's internal representation of the world by rearranging and combining the categories which we had previously thought to be satisfactory. Philosophically, Koestler's view of creativity has, perhaps, even more significance for me as one of many useful bridges between psychology, philosophy, and the educational process. It is to such considerations that I wish now to turn.
We have to deal with human reality as a being which is what it is not and which is not what it is.

Koestler's model of creativity bears directly on the philosophical notions discussed much earlier. The creative flash arises from the combination of two or more perspectives which had formerly been separated or even seen as mutually contradictory. If the world were as the realist would have us see it, there would be much to be wary of in a theory of creativity based on paradox, combining of contradictions, and the breaking of standard categories. But if the world is inherently contradictory, if the universe is an undifferentiated whole which necessarily displays paradoxes when it is described in language, then Koestler's characterization of creativity makes eminent sense.

The argument I am searching for is considerably more detailed than ought to go in the body of this document. It hinges on the difference between a world-view which accepts and expects paradox, and one which fights furiously to avoid the contradictory. We of the West, being well indoctrinated Realists, find paradox a strange and uncomfortable bed-fellow. If forced to delve into a self-contradictory statement like the Cretian saying "All Cretians are liars," or "All generalizations are False", we search desperately for the flaw in the statement. Or, if we happen to be Bertrand Russell\(^1\) and find such an irresolvable paradox at the foundation of an entire scheme of logic, as he did, then we reconstitute the rules of logic to disallow the paradox. A world which
obeys the rules of realism simply has no room for paradox and contradiction.

But the realization that we live in an undifferentiated world carries with it not only a tolerance for, but a certain amount of relish in, contradictions. The Japanese lives (or at least used to live) in such a world. For him, the two statements "This is a book" and "This is not a book", though contradictory, could both be seen as true at the same time. For him, the statement "All generalizations are false" could be both true and false at the same time without causing any discomfort by the fact that, in either case, the statement is a real, unavoidable paradox.

Creativity, as Koestler has described it, requires the acceptance of such a paradox. It requires that the creator submit to the fact that his categorizations of the world contradict themselves, and yet must be accepted and brought together within a single framework. As such, the act of creation is, for me, a small example of the kind of mystical experiences and schizophrenic experiences that I have described earlier. It is one small instance of the realization that words do not describe the world as it is; that categorization is inevitably faulty in a world that exists uncategorized. We create, if you will, when we destroy our preconceptions of the order and separateness of what we see as differences in the universe. We create when we realize that two "points" on the world-hologram are not separate as we had formerly believed they were. If the simple act of creation is the pulling together of one pair of formerly separated perspectives, then the ultimate act of creation is the mystical experience - the realiza-
tion that all perspectives are the same, that paradox is inevitable and integral to the verbalization of an unverbalizable universe.

Philosophically, then, Koestler's Act of Creation is a demonstration of the kind of contradiction which is crucial to the "successful" use of words in a world which words cannot describe. Psychologically it is, as I have already mentioned, a description of one important way in which people come to change their cognitive maps - by simultaneously calling to mind two separated aspects of those maps. The relationship between philosophy and psychology thus seems to be very close on this point and, since I claimed earlier (see Chapter IV) that an adequate psychology must explain itself as well as its philosophy, this would seem a good place to begin that attempt.

Let me start with the obvious. The psychological arguments which I have been using do not, except for the fact that they rely on words, begin with a realist's view of the universe. Rather, they start with the assumption that whatever order we find in our lives is there because we have created it and imposed it upon a genuinely chaotic world. But, at the same time, the evidence and theories which I have used make some progress toward explaining how it is that we do, in fact, impose order on the universe. The psychology thus begins with an assumption that it, later, tries to explain and confirm. And if that is paradoxical, so much better for the philosophy! So far so good - at least we have the beginnings of a psychology which tries to explain its own assumptions.

Now, the somewhat less obvious. Assuming that a cognitive map psychology can explain and defend the very assumptions on which it is
grounded, how does that psychology explain and defend itself? Here I sit, a human being who, by virtue of that fact, presumably operates in the ways I have been describing as true for all human beings. I am executing certain Plans, called on by certain Images all of which have been built in by a lifetime of experiences and all of which, by my own admission, are arbitrary ways for me to impose order on a chaotic world. Does my psychology and my philosophy explain me? Does it account for itself and for my insistence upon inner maps, Plans, Images and the rest?

To be honest, I'm not even sure of the best way to approach such questions. A complete autobiography would, of course, be helpful, for then the reader could judge for himself the ways in which a cognitive map theory would help explain my insistence upon cognitive maps. But more revealing, or at least easier, is a close look at this document. As I cautioned in the Introduction, it must be seen as no more and no less than a reflection of my own biases and commitments. There is literature, in psychology and philosophy, which I have not included here because in its pure form it would contradict things that I believe. Equally to the point is the fact that the astute reader will, at this point, have a good idea of what literatures I am referring to and, at the same time, will realize that if I did refer to them I would interpret them in my own particular way, so as to make them fit the psychology and philosophy that I am espousing.

It is this latter point which, more than anything else, seems to me to be crucial. All that I am writing here, and all that I am not writing, is a reflection of the screens, biases, and maps which I use in
interpreting my world. When I look at the world, when I talk about it, and when I use categories to describe it I am inclined, or perhaps forced, to do so in the very ways I have been describing. This document is, in a very real sense, an autobiography. When I investigate human beings I am inclined to look at the ways in which they screen perceptual input and organize their chaotic experiences into a world. Why? Because that is the way I screen my inputs and organize my chaotic experiences. When I look at humor and Japan I see the Zen view of an undifferentiated universe, and at the same time realize that a different observer (e.g. the reader) might well see something completely different. When I investigate the General Theory of Relativity I see the way in which a strong commitment to a theory warps and interprets a meaningless mass of data, realizing full well that other investigators of the same events must find confirmation of their different biases there. And when I delve into the life of a Supreme Court Justice I must focus on the ways in which that Justice's biases have controlled his decisions, because my own biases control my own decisions and perceptions. Thus, if there is any evidence available as to how my psychology and philosophy help to explain themselves and my own development of them it is in the ways in which my own biases and perceptual screens have produced this document.

One last point regarding this complex issue. Do I claim that my statements in this document are "true" and should be taken as describing a world existing outside of me? Quite obviously not. What I am describing is the way in which I experience the world, the categories I use to describe it. Some readers may be persuaded to change parts,
small or large, of their cognitive maps by virtue of having read this. Most readers will probably accept what fits their existing maps and reject the rest. So be it, for we all have our blinders on and mine are nonetheless in force for having been spelled out in detail here.

The philosophy and psychology under discussion, then, seem to tie together fairly tightly. First, in that they represent basic aspects of one person's Weltanschauung (mine). More abstractly, in that they mutually support each other's assumptions. And finally, a new point and the one which I suppose the reader has been anticipating for a while, in that they support the same conclusion regarding who knows what's best for individual learners. Implicitly, all of the philosophical and psychological arguments I have presented urge us to the realization that individual learners are the best judges of what they need to know at every point in their educational careers. But let me make those ties more explicit.

What we call "education" is concerned almost exclusively with the development of cognitive maps as I have described them. We teach our students to slice the world up, categorize and systematize it, describe and "explain" it verbally, and react to it on the basis of those categories. But if the world is, "in fact", undifferentiated, then any system of categories will do as well as any other. There is no right or wrong in terms of slicing up a world which isn't "really" sliced up. In a world where categories are the products of man's minds and not of things-in-themselves, the educator's curriculum is an arbitrary thing, possessing no Authority beyond that contained in the educator's commitment to it. The teacher seeks to pass on his knowledge to his students,
but the key to his knowledge is his commitment to a vast system of arbitrary, ultimately indefensible categories, ideas, and theories.

Viewed from the perspective of the "world-hologram", the compulsory system of education which we so cherish is scarcely short of an immense perversion. A group of educators who do not have, and never could have, any special corner on The Truth are able, through what amounts of brute power, to determine for students the ways in which they will see the world, divide it into categories and, thus, react to it. There is, and can be, nothing special about the particular way that educators categorize the world but, nevertheless, compulsory education will assure that all students are required to experience the world that way. We will consider some of the practical disadvantages of such a system in the next chapter, but without wishing to sound too much the moralist I would suggest that this monopoly of power, this excessive control of our students' lives and perspectives, is at best indefensible and at worst catastrophic. There is no One Best Way to categorize the world, and we are constantly deceiving ourselves and our students by perpetuating an educational system which assumes not only that there is such a Way but also that educators know it, at least in broad outline.

It might, of course, be argued that the world-hologram notion, if taken seriously, does compel a certain kind of education for everyone - an education quite different from that which we currently label as such. That is, we might argue that the task of education ought to be one of making sure that all students participate in acts of knowledge, living in, mystical experiences as often as possible. As a lofty aim for education, this program is eminently attractive to me. As I shall mention
briefly in the next chapter, I see it as one of the major problems of our times that students do not have the opportunity to become committed to something, to lose themselves, to be creative - to live in. But adding the contemporary notion of compulsion to that lofty ideal seems to me not only useless but positively harmful. For the crucial element of the act of knowledge is the personal involvement and commitment inherent in that act. And I cannot force you to feel that sense of commitment. Indeed, as the Zen literature so aptly demonstrates it is even impossible for me to force myself into a "self-loss" experience. The harder one tries, the more one is compelled either by himself or especially by others, the less likely it is to occur. In fact, the existential literature would suggest that one key road to a living-in experience is the experience and feeling of complete freedom. In any case, coercion and acts of knowledge do not go well together. I would greatly hope that more of us could experience the universe in its undifferentiated wholeness, but the very best we could do as educators would be to provide likely possibilities for students and then give them maximum freedom to explore and find a sense of commitment. More than anything else, it is the element of compulsion in our current system which stands between students and acts of knowledge. By pushing them in the directions that we want them to go, we mitigate against the possibility that they will become so enraptured by something of their own as to live in it and thereby gain knowledge.

Psychologically, our system of compulsory education is equally indefensible. In my terms, what we commonly label as education is the process of trying to change other people's cognitive maps so that they
contain categories, screens, ideas, or theories that we want them to contain. But remember that cognitive maps change only when they have to - i.e. when they meet with some discrepancy between what they predict and what happens. This can occur in several ways, to be sure:

1. My fact-Images may not square with input from my senses;
2. Two or more of my fact- or value-Images may conflict when brought to mind simultaneously (Koestler's ACT OF CREATION);
3. I may be frustrated in attempts to achieve some value-Images by lack of suitable Plans.

Thus, we can. psychologically, describe different kinds of situations in which people will be motivated to learn - to change their internal representations of the world.

But the educator of the modern world is far more audacious than that. By virtue of his prescription of a curriculum's "scope and sequence" and his further prescription of the way in which material is presented, he presumes to know what each student needs to know at all points in his educational career. Therein lies the height of presumption. Faced with a class of, say, thirty students whose life experiences (and thus cognitive maps) differ very considerably, how is the teacher to know who needs what, when, and in what form? How does the teacher look into each student's cognitive map, see what discrepancies (actual or potential) are there to be resolved, and then provide a common experience which will fill in all of his students' gaps satisfactorily? Seen in this light, the task of educating one student, much less a class of thirty, takes on a rather different perspective - one which ought to strike fear into the heart of any teacher who feels he is slightly less than omniscient.
Psychologically, the question of who knows what a person needs to know boils down to the more basic question of who knows a person's mind. Granted that my cognitive map is enormously complex and contains many screens, assumptions, and discrepancies that I am blissfully unaware of, I would be hard-pressed to defend the notion that anyone else besides me can gain a greater knowledge of that internal map than I currently have. To put it much more simply, I do not know myself perfectly by any matter of means, but I know myself better than anyone else does or can. The current structure of compulsory education assumes that such is not the case. It assumes, in fact, that educators can prescribe for all children what they need to know, when they ought to learn it, and how that learning can best occur. Unless educators are considerably more clairvoyant than I have been led to believe, that assumption is challenged by a fairly impressive body of cognitive and physiological psychology.

Individual students, then, are always the best judges of what they need to learn at every point in their lives. First, because in an uncategorized world no-one has or can have a corner on Knowledge. Second, because individual human beings know their own minds better than anyone else does or can. Having traveled through eight chapters of philosophy and psychology, the reader is right back to where we started in the Introduction. To some extent I might rightfully be accused of playing cat and mouse. It would be difficult indeed for me to assure the reader that my conclusion regarding who knows what's best for students is based on the preceding seven chapters of arguments. For those seven chapters are equally based on this chapter's conclusion.
It is, if you will, a chicken-and-the-egg problem as I warned the reader in the Introduction. Quite frankly, it makes little difference to me which is conclusion and which is premise. The whole thing makes a fairly neat bundle and you are free to look at it from whichever end you please.

At this point, however, I will let the point stand on however secure a theoretical base I have been able to build for it. In theory, at least, students know what they need to learn better than anyone else. In practice, what happens in schools that violate this principle? If we look at schools and classrooms that claim to know what students should learn, what can we say about the effects on students? And if those effects makes us uncomfortable about our entire educational system, where do we go from here? If compulsion destroys meaningful education, how do we educate without compulsion? Now that we have emerged from the trees and can see the forest, I wish to turn briefly to such pragmatic questions.
Those who can, do. Those who can't, teach. Those who can't teach, teach teachers.

I do not think it would be an exaggeration to say that education in America is but a hair's breadth from disaster. Ours is a mystifyingly complex society and it is not being served well by an educational system which changes far too slowly. In an age where men are circling the moon, we continue to have a high school curriculum that includes Latin. In an age when mankind has the capability for blowing himself off the planet ten times over, we have difficulty conceiving of education as anything but 30 students required to listen to one teacher for 50 minutes in a classroom a century old. At a time when human problems have become so large as to outweigh all else, when cities are about to explode and suburbs stare on in apathy, we continue to insist that courses in History of Education and English Methods will produce good teachers. And in a society becoming increasingly sensitive about issues of power, the schools still reign supreme over their students, despite growing protests.

It is, of course, this last point which seems to me to be the crux of the matter. Unlike so many educators, I am not the least bit sure that I or anyone else could successfully describe what ought to be in the curriculum for all students or what kinds of teachers we ought to have in our schools. I have my pet subjects, and to me they seem virtually indispensable. And I have had some outstanding teachers who
would serve as my models if I ever undertook the task of describing the ideal teacher. But these are nothing more than my peculiar biases in curriculum and teaching, no more nor less defensible than those of any other educator, and all of them are far less defensible than a student's biases, when it comes to educating that student.

Education, after all - whether compulsory or not - is for students, and who can possibly know a student's needs better than the student himself? But our present system of education simply does not recognize a student's capacity for self-knowledge. At all levels, from kindergarten through doctoral programs, and in virtually all of its aspects, from the teacher to the curriculum planner, American education wallows in the deception that it can prescribe what is best for its students. We formally require that students be in school at least eight years, and the economic structure of our society is more and more requiring 16 years of school as job preparation. And having forced their physical presence in schools, we proceed to carefully order, according to our biases, the "learning environments" of our students.

The school, not the student, decides what the student will study, for how long, in what circumstances, and in what sequence. The school even decides what time of each day the student should be thinking about what subjects. From nine to ten every morning, the student should be a mathematician, but at ten he should become a linguist and at eleven an expert on state capitols. And woe unto the student who has a brilliant mathematical insight during "English time"! And, to make the bizarre outrageous, the teacher even controls what the student should think and say within each of those hours. If the student doesn't know the right
answer when he's called on, it does him little good to have known it five minutes earlier or to learn it five minutes later. To talk in class about matters which the teacher finds irrelevant borders on the sinful, however relevant it might seem to a student.

To some extent, I will admit to creating a strawman, a parody of our public school system. But I would hasten to add that, to a large extent, our schools are themselves a vicious parody of education. What amazes me most about them is the extent to which they control the lives of their students. And what frightens me most about many recent developments in "scientific" education is that the desire of educators is for more, not less, control. Dogmatism has always horrified and perplexed me, but to see it institutionalized in schools is more than I can bear. It is the conception which we have of the schools as authorities on what every child should learn and how he can best learn it that seems to me to be ruining the educations of most students. I have already devoted eight chapters to explaining why, in principle, I think that assumption is wrong, but on a practical level the assumption ends up being almost malicious.

The dangers of school dogmatism are most apparent and saddening in its dealings with "below average" students, a point which an anecdote might best illustrate. One of the most enthusiastic, alive groups of students I have ever taught was a group at the "bottom 20 per cent" at a somewhat "below average" high school. Of course, the students hated school, found it immensely boring, disliked most of their teachers and all of the school rules, found the curriculum totally irrelevant to their interests, and in general disagreed with everything the school had
to say. But what amazed and frightened me was that they agreed with
the school on one crucial point: it categorized them as stupid trouble-
makers, and despite their hatred of school, they agreed. Furthermore,
the school equated "being smart" with "being a good person", and so did
my students. Twelve years of schooling had done almost nothing positive
for these students by way of helping them to learn skills or relevant
branches of knowledge, but it had been brutally successful in a
negative way. It had so destroyed their images of themselves as to make
them feel they were stupid, worthless, troublesome human beings.

It seems to me very important to understand what is going on in
a situation like this and exactly how it is that the school's assumption
of its own authority is so successfully devastating these students. For
one thing, it is becoming increasingly obvious that much of America's
current difficulty in educating its black students hinges on exactly the
same factors - the white school's power to set and enforce standards of
what is a good human being. And for another, the anecdotal works of
authors like John Holt\(^1\) and Paul Goodman\(^2\) suggest that the same attitude
in the schools interferes with the learning of all of its students, how-
ever "bright" they might be by conventional standards.

What was happening to my students, and what is currently happening
in schools throughout the country, is that the school defined for them
what, when, and how they should learn, all the way through their
educational careers. The definition of learning and ability to learn
(and hence, in our society, quality of human-hood) was prescribed by
the schools and literally forced on its students with no thought or
credit given to the students' different interests, styles, motivations,
or abilities. And if a student didn't learn in the narrowly delineated ways that the school set forth, then he was incapable of learning and somewhat subhuman. If I had to consciously devise a scheme for destroying the self-images of students and preventing them from learning, I doubt that I could do better than what the schools already have done. The student who is simply not interested in the narrow range of things that the school has to offer, or whose cognitive map is different than his teachers' and hence attuned to different kinds of information, must leave such a system convinced of his own inferiority and inability to learn anything.

What we have, in essence, is a school system which assumes that it knows what cognitive maps (world-views) its students ought to have and assumes that it knows the procedures which students must follow to build that cognitive map. The system is dreadfully wrong on both counts, and students who reject its instruction must sense this, but the students, too, accept these assumptions and interpret their own failures accordingly. And, worst of all, the schools are unable to see how wrong those two assumptions are and how damaging they can be to students. The schools do not and cannot prescribe for students what they ought to know - the "right" way to categorize the universe - for there is no such beast. The curriculum that we force students to accept (or to reject on peril of destroying themselves) does not represent The One True Way to look at the world, and what makes it dangerous is not the fact that it is wrong in the way it slices up the world, but that it presumes to be Right with a capital "r". No, it's even worse than that, for the schools have the power of compulsion to make students believe that they are
Right and any student who sees the world differently is Wrong. And the schools only compound error upon error by assuming that they know the best ways to assure that students get what is Right. For by prescribing the sequence of a curriculum, the Training of teachers, and the nature of the classroom situation for all students, the schools virtually assure that many students will fail. The cognitive maps of students in school are as diverse as we could possibly conceive, and however sophisticated the Educators' Instructional Method might be, it will inevitably fail to mesh with the minds of many students if only because the educator cannot see into those minds and thus cannot know what pieces will fit into the puzzle in what order.

John Holt's HOW CHILDREN FAIL, Jonathan Kozol's DEATH AT AN EARLY AGE, and Herbert Kohl's 36 CHILDREN seem to me the best popular descriptions of the ways in which school dogmatism can destroy students. Somehow, due to the legal authority vested in the schools and their crucial link to the American economic ladder, failure at school comes to be quickly equated with failure as a human being. And this entire atmosphere of fear of failure permeates our school systems at all levels - from failing to graduate, to failing to be in the top 10 per cent of the graduating class, to failing a particular course, to failing to answer a particular question correctly. Instead of being an educational environment the school grotesquely transforms itself into a proving grounds for self-hood. If you meet the pre-set criteria of educators, a very narrow set indeed, you are a good person and if you don't you're not. Those criteria are, of course, arbitrary, narrow, haphazard and totally inappropriate for a lot of students, but nevertheless they are
the standards against which we judge our students and, ultimately, our students judge themselves. It's the last half of the preceding sentence that is most troublesome, for it is something which we have systematically failed to notice. But whether we pay attention to the fact or not, the schools do, by virtue of their compulsory nature and their attitude of supreme rectitude, mould the judgements of their students about themselves. And since the system has such a narrow tolerance for what constitutes good performance in school, a frighteningly large number of students leave the system with truly miserable opinions of their self worth.

But the effects of compulsion on "good" students, though less frequently noticed and less socially controversial than what I have been describing, seem to me to be equally severe and depressing. The students who "make it" in our current system have done so because they succeed at playing our game in what we consider to be an exemplary manner. If they feel good about themselves (and they do so to a greater extent than that "bottom 20 per cent") it is because they, too, have accepted the schools' criteria of what is a good person and what is not. And deeply embedded within those criteria is the implicit (and sometimes explicit) notion that a good person is one who does what his superiors (i.e. teachers) tell him; one who accepts their standards, their values, their interpretations, and their styles of living. Whatever else a good student in current American schools might be, he is definitely not a person who respects and follows his inner light.
When I talk about "good" students, I am, of course, primarily referring to those in suburban settings where a major criterion of "good" is going on to college. And many of the problems which I see the schools helping to foster in such students through their compulsory nature have been vividly described in Kenneth Keniston's THE UNCOMMITTED. His description of the suburban student (and his parents) matches those of such authors as Paul Goodman and Edgar Friedenberg and paints a fairly uncomplimentary picture of the effects of compulsion upon "good" students. Forced into a school and community situation which is severely limited in its diversity, such students emerge with a severe lack of sensitivity to basic differences in world view, with a fairly deep-seated conviction that the middle class school's values are right for all human beings, with a complete lack of awareness of the rich diversity in ethnic, religious, and economic climates that exist in America, and with a large dose of "uncommittedness" and apathy.

These "good" students have gone through a school system which has told them, authoritatively and with the backing of their parents, how to look at the world, what to know, what is good and what is bad, and what standards to use in evaluating themselves and others. Above all, they have learned that it is good to do what you are told, especially if the teller is a teacher who, presumably, knows what's best for you. Such students certainly do not trust their own judgement, their own ability to make decisions for themselves, or their own values and feelings. In fact, it is sometimes doubtful that they even have values, feelings, and judgement of their own. In any case, what values they have and operate by are not the result of close personal inspection and
existential commitment. They have been committed to a set of values and a world view by others without ever having made the difficult, emotional, personal commitment to those values which would give them life. In some very real sense they are machines, acting out the commands of others, with no sense of personal involvement, risk, enthusiasm - in a word, with no sense of being alive.

To claim that all of this is a result of the compulsory nature of schools would be an over-simplification which is too extreme for even me to make. The parental environment, the entire suburban culture and, indeed, the gargantuan social forces that are operating in Twentieth Century America are all implicated in the "good" (as well as the "bad") student's plight. But to deny the role of the compulsory school in fostering a lack of self-direction is equally disastrous, for the role is there and is, perhaps, more subject to change than some of the other factors which seem to be involved. Again, let me illustrate briefly from my classroom experience.

I was teaching a class of high school seniors in an upper middle class school (near a prestige University) and the students were definitely college material, all of them. The first revelation was a fairly obvious one: by asking them why they wanted to go to college I quickly found that they had never even considered the possibility of not going. They had no idea of any possible alternatives to going to college, and had "just always assumed" it was good for them to go to college, right after high school. The title of the course was "American History" and that frequently set the stage for other revelations. When our class discussions drifted away from history into psychology or
philosophy, the students always became more responsive, alive, and involved. But at the same time they felt guilty for not learning history. They enjoyed learning psychology. They enjoyed learning philosophy. And they even enjoyed learning history in an unconventional manner (e.g. theories of history or the personal lives of famous people). But they would frequently complain about "not learning what we're supposed to be learning" even though that (stale, textbook history) was boring and repugnant to them. Finally, though these students were given the opportunity to explore any area that they wished in any way they wished without penalty (they had the ultimate voice on their grades in the course) most of them had extreme difficulty in deciding on something to explore and few of them, over the course of a semester, ever got deeply involved in something that interested them. This is in contrast to another class (the bottom 20 per cent of a very "average" high school) whose students responded creatively and enthusiastically to the same challenge.

"What we can glean from this," to paraphrase a Judy Henske song, "is that the students had the wrong attitude about a lot of things." They simply did not trust their own interests, their own values, their ability to make choices for themselves. Although they disliked standard history, they felt a strong compulsion to sit through it anyway since that's what their mentors expected of them. They had swallowed, without question, the values of their suburban teachers and had great difficulty in conceiving of (much less adopting) any other set of values. And when their personal opinions, values, ideas, or goals did not fit the standard pattern, they trusted to the pattern, not to themselves.
They would rather be bored learning what the teacher wanted them to learn than to be excited and involved in something that they wanted to learn. To put it another way, they had great confidence in their ability to play the teacher's academic game successfully, but no confidence whatsoever in their ability to invent their own rules. To merely ask them what they believed firmly in, what they held so dear that they'd give their lives for it, what they could get so involved in as to disregard the rest of the world, was to ask them a totally meaningless question. They believed in obedience to their teachers and could hardly conceive of such a thing as personal commitment.

The extent to which such qualities in students can be traced to the compulsory nature of education is, of course, difficult to determine. There are other social forces (particularly in the middle class suburb) which tend to work in the same direction. But, be that as it may, it is still the case that compulsion in the schools does leave little room for a student to set his own standards, adopt his own world view, and live with his own set of commitments. When an educational critic like John Holt, for example, berates the schools for inducing a "fear of failure" he is, I think; speaking very much to the same point. It is not, I submit, that Mr. Holt wants us to prevent standards from ever seeing themselves as failing by their own standards, for that is a natural, and perhaps even healthy, human process. The danger lies in the fact that the compulsory school automatically sets the standards of failure for the students. If he fails to meet those standards, he sees himself as a failure. It is the fact that students are literally coerced into accepting the schools' rather limited and very arbitrary
standards as the basis of their opinions of themselves that stands in the way of any real education or any real personal growth.

The compulsory nature of education, then, stands in the way of many of the most important things we would all like to see happen to students. It necessarily fails, by its narrowness of standards, to capitalize on the rich diversity of perspectives which it otherwise might foster. It dangerously interferes with the student's ability to set his own value standards, define his personal worth to himself, and feel that he is in control of his own destiny. It fosters the kind of student who is little above an automaton - accustomed to obeying orders, unable to guide his own life, and completely unfamiliar with the feeling of control and commitment that is at the essence of being fully alive. And it even fails to supply its students with the skills and category systems that the system sees as crucial to all students. For even in the teaching of skills like reading, the element of compulsion in our educational system tends to prevent students from learning as quickly and pleasantly as they otherwise might. When it is always the teacher who decides when and how Johnny should learn to read, it is no surprise that many Johnnies never learn to read. The teacher, after all, cannot see into Johnny's mind and that is precisely what the teacher would have to be able to do in order to really be in a position to tell Johnny when and how to learn to read.

Compulsion and the concomitant lack of diversity and alternatives for students, seem to me to be severely implicated in many of the failures of modern education. Let me conclude, then, by briefly describing the kinds of learning situations that would both be more in
accord with the philosophy and psychology proposed here and would, at the same time, help to remove those failures by removing compulsion from the educational setting.
CHAPTER X

Education and the Smell of Joy

What happens when a child learns under his own direction? What happens when no one is telling him what to learn, when to learn, or how to learn, but he is free to pursue things as they interest him? What happens when adults are free to share their judgements with students, but do not have an ax (grade) to use if the students reject those judgements? In short, what happens when students are given total freedom and responsibility for their own learning?

Let us consider some anecdotal examples of learning which seems to come closer to the conditions of freedom suggested in the above questions than does the typical American school. A very young infant, for example, learns a great deal about his world despite (or because of?) the fact that no-one has prescribed a curriculum for him, told him when to learn what, or designed a method for his learning. He learns to control his own body, to control general aspects of his environment (indeed, he learns that there is an "I" and an "environment" which can be separated from each other), that there are such things as objects which are relatively permanent and do not disappear when not observed.... He learns to crawl, to walk, to understand words, and to talk. We could go on and on with the enormous list of basic concepts and skills that young infants and children learn without ever being coerced into learning - indeed, with no one having the slightest idea of how to teach them such things if they wanted to.
Or consider the, again, pre-school child's intense fascination with the world around him; his ability to look at a single flower for hours or to repeat a simple act over and over and over again; his at times incessant and, for his parents, unbearable asking of that nasty little question, "Why?"; his general ability and desire to do things, learn things, build a meaningful world for himself. Now I am not just trying to make an old point about "the natural curiosity of children." It is true that children are by nature curious in the sense that they begin with a world almost completely lacking in structure and have much need to make sense of it. - i.e. to build their own cognitive maps. But I am more interested in the kind of learning that goes on in such situations as I have mentioned. They are situations which differ from school experience primarily in the fact that there is no formal structure, no one has set their educational goals and means for them, they are free to explore their world and build it on their own. Is the quality of their learning different from that in the schools?

I would claim that it is, substantially so. The self-directed learning of young children is characterized by precisely that sense of commitment and total involvement which is usually lacking in the schools. Learning, for an infant who is not told that he must learn something, is a joyful experience. A young child can be literally enraptured by a new skill (e.g. closing his fist, sticking out his tongue) that he is learning, or a new phenomenon (a flower, a rock, etc.) that he is trying to build into his view of the world. There is joy in learning for young children, and so they revel in it. It is no surprise to me that our earliest years are our most crucial ones. We learn far more in our
earliest years than we will ever learn in the rest of our lives, and
the learning we were engaged in then was characterized by the smell of
joy. It is as we got older, as we learned that we ought to learn what
certain other people thought we should learn, as we lost the freedom to
pursue the things that genuinely interested us at the moment, that
learning became unpleasant and that we began learning less and less.
We are creatures of joy, seeking pleasure, and compulsion drives the
joy out of learning.

We can, of course, find other examples of the smell of joy in free
learning involving students much older than the pre-school child. They
are more rare since our educational system does not foster them, but
they exist. There are students who become absorbed in particular topics
of their own choosing, usually to the teacher's dismay but occasionally
with his approval. Virtually every school has those few students who
are real experts on something-or-other through their own initiative.
And many students at all levels thrive to some extent by using the
compulsory school as an intellectual supermarket - taking what they need
or want and sleeping through the rest. The point is not that learning
stops when the schools take over, but that the schools do virtually
nothing to foster self-directed, committed, joyful learning. To do so
is to admit that students know what's best for themselves educationally,
and the schools are far from admitting that.

The best example that I know of to illustrate the potential power
of self-directed learning comes from an as-yet unpublished experiment
performed by Robert Mager. The experiment involved adults, but I con-
sider that to be irrelevant for it is the comparison between teacher-
directed and student-directed learning that I wish to center on. Mager was hired to write a programmed instruction manual which could replace a 10-day course which was being used to train women to read electrical meter dials. Mager wrote the text, and was enormously pleased to find that women who worked with it for merely eight hours could read the dials as well as those who graduated from the 10-day training program. Had the experiment stopped there it would have been interesting, but irrelevant to this discussion.

But Mager then created a third condition for learning to read the dials. He told a group of women about all of the resources which were available to them that might help them learn to read the dials - people whom they could question, dials they could practice on, the programmed texts, other books, etc. Then he turned them loose and told them to go about learning however they wished. The women went off in all different directions, some to play with the dials, some to read, some to ask questions. In an average time of TWENTY MINUTES this group was more proficient at reading the dials than either of the two preceding groups. When given a wide range of alternatives and allowed to structure their learning as they, individually, wished their learning was substantially more efficient than when they were required to follow someone else's prescription.

There are other "experiments" which appear to teach the same lesson. The Leicestershire County Schools and Summerhill in England, several private schools in America (e.g. The Sudbury Valley School, Pacifica High School in California, some Summerhill-modeled schools), and several public schools in American which are providing substantial
amounts of "unstructured time" for their students seem to be pointing the way toward giving students responsibility for their own learning. Much theory and some practice suggest that we need to devise ways to allow students to have control of their own educations, so let us briefly consider some possible changes in American education that might move in that direction. The variety of changes in education that would help students to control their own educational careers is as diverse as the ways in which compulsion currently exists in the system. The coercion is explicit in our compulsory attendance laws which require students to be in school, usually through the age of 16 or 18. It is more implicit, but nonetheless real in the growing economic necessity of going to college and, thus, the college's control through its admissions criteria of the lower school's curriculum. But compulsion is present at much more discreet levels within each school. It takes the form of dress codes, closed campuses and closed classrooms, narrow curricula which offer no choice to students, rigid classrooms which offer no choice within given courses, and perhaps most clearly and disastrously in the form of teacher-assigned grades.

This entire problem of assigning grades to students for their work in particular courses is such an old one and has been discussed so lengthily that I wish only to mention it in passing. Whatever else can be said, it must still be admitted that grades are a problem, and the current trend toward basing grades on performance criteria or behavioral objectives will not get to what I believe to be the heart of the matter. Whether they are grades assigned at the teacher's whim or elaborately defined behavioral objectives, we are still left with a situation where
the student is evaluated by a teacher, in the light of a teacher's standards, and succeeds only when he performs the way the teacher wants him to. However loose, unstructured, and student-centered a classroom might be, the fatal element of compulsion is always lurking around the corner if the teacher assigns grades to his students. With the power to grade, the teacher can always let the ax fall when the students aren't doing what he wants them to do. If there can be real freedom in a teacher-graded classroom, it must always be tinged with a substantial amount of fear and distrust of the grade-giver. The students are free in what they do only so long as the teacher doesn't drop the ax. It is like being free to scamper in a meadow in full knowledge that an expert marksman is standing over you with full power and ability to cut the scamper short whenever he so desires.

Any proposal which attempts to remove any of the above-described elements of compulsion in American education would be an important step toward making education more sensible, at least in light of the considerations in this document. For a start, let us consider the largest, most impractical, and probably most effective possible step. If we were really committed to giving students the final responsibility for their own learning, we might begin by abolishing all compulsory, public education and leaving the entire educational system on a free enterprise basis. The idea here is for students to have a real choice in all matters relating to their education in the way which has most authority in modern America - through money. As I envision it, a free enterprise system of education would enable students to pick and choose among a great variety of educational opportunities. The system would operate by
a sort of Intellectual Law of Supply and Demand. Students would create the demand by having money to spend on educational experiences, and the demand would be met by a wide variety of individuals, groups, and corporations who wished to make their fortunes by supplying what the students demanded and could pay for.

As I see it, an educational system which literally allowed students to buy whatever kinds of education they could find on the market would literally shower students with possibilities. Individual teachers would "hang out their shingles", groups would form educational clinics, corporations would invest in large educational centers, all sorts of people would develop and advertise educational experiences which they felt would tap the needs of students. Those teachers and/or experiences which did, in fact, meet a felt need of students would survive and even flourish. Those which failed to meet the needs of students or which students merely found too distasteful or irrelevant to pay for, would die a quick financial death. The key elements to the success of such a venture would be first that it would provide a rich diversity of possibilities for students and second that students would individually have control over the experiences which they encountered and collectively would have control over the variety which was available to them. Insofar as the market remained open, insofar as monopolies were prevented and competition for student resources existed, insofar as educational possibilities were well advertised to students, and insofar as students (rather than their parents or, indirectly, college admissions criteria or college board exams or some other institutional criteria) had real control over the spending of their educational funds, a free
enterprise educational system would successfully eliminate compulsion from education and provide a rich atmosphere wherein students could learn joyfully the things they found to be most relevant.

There are complications and difficulties with such a proposal ranging from parental control of student's choices to the ethics of the large corporation. Were this a different book, I might spend more time in dealing with such problems but I wish here only to suggest a diversity of proposals which might help to implement the philosophical and psychological considerations I have already dealt with. Furthermore, the free enterprise notion of education is not a new one, and the interested reader is encouraged to look at similar proposals made by Milton Friedman and by Jencks and Reismann. Furthermore, I have dealt with some of the practical issues involved in free enterprise education in a bit more depth in my "The Free Enterprise Teacher", *School and Society*, April 1969.

There are several other levels at which compulsion can be removed from education so as to make it more relevant and more joyful by allowing it to be more personal. We could, for example, retain public educational institutions but fill each school, from kindergarten through college, with a rich diversity of alternative courses and experiences, letting the student pick whichever of the offerings he deemed to be relevant to him, in any sequence and for any length of time. Instead of having lock-step, scope-and-sequence curricula, the public schools and their teachers could serve as resource centers to students. Supplying alternatives which students freely selected, and
which survived and died out on the basis of student demand and interest.

One way to make such a publicly student-directed system work would be to replace the current notion of a transcript and grades with a student portfolio. Throughout his educational career, a student could compile a portfolio which included his descriptions of his educational experiences, the comments of others on those experiences, an accumulation of the student's work (e.g. papers, films, drawings, machines the student has built, etc.), and a series of comments and reflections by teachers on the student's perceived strengths and weaknesses. The portfolio, and an abstract of it, could serve as the basis for any decisions which some educational institutions (e.g. colleges) might want to make regarding admissions, and could also serve as a basis for the decisions of future employers. Rather than accumulating a record of courses taken and grades earned, the student would assemble a portfolio which described his experiences as evaluated by himself and others and would thereby be free to engage in whatever educational activities he wished, rather than being forced through a prescribed curriculum over which he has no control. But compulsion can be removed at even more discrete levels than that of individual institutions and school-wide portfolio systems. Individual teachers can operate their individual classrooms in such a way as to leave the student free to make his own educational decisions. It is, in fact, a fairly simple procedural matter. If the teacher merely assigns to his students the responsibility for evaluating themselves, for giving themselves the final grade in his course, then the individual
classroom can be opened up so as to allow students a great measure of educational freedom. When students evaluate their own progress, they are free to accept or reject the judgements and offerings of the teacher as they see fit. If the teacher's activities in the classroom are not meeting his needs, the student is free to go elsewhere and pursue whatever he wishes, without having to fear the teacher's power to drop the ax. When the student grades himself, he has the ax, and with it the power, freedom, and responsibility to guide his own learning. In such a situation, the role of the teacher quickly shifts from one of authoritative dispenser of information and wisdom to one of resource-provider and possibly even a helpful human being.

For the teacher, the act of giving over his ax to his students, though initially sometimes a threatening process, can be an immensely rewarding and freeing experience. Both students and teacher can benefit from the increased openness and honesty which an ax-less teacher can display. Without the power to enforce his judgements arbitrarily on his students, the teacher is free to share his judgements and personal biases as a human being interested in his students, but not in control of their lives. When students grade themselves, teachers are free to be human beings instead of presuming to be authorities, and students are free to rely on their own judgement even if it conflicts with the teacher's.

We would continue to catalogue specific proposals for change of this nature in education almost endlessly - teacher education programs could encourage and help teachers to conduct student-directed class-
rooms; administration programs could encourage the adoption of the portfolio, no-requirement approach; institutions of higher education could give serious reconsideration to their narrow entrance criteria and the effects they have on lower schools, etc. But to put the whole thing very bluntly, all such changes will ultimately rest on a substantial change in the attitudes of Americans in general and educators in particular. As long as we continue to believe that students need our direction and authority in order to become "good" people; as long as we believe that we know what is best for students; as long as we distrust the judgement of our students, we will continue to assure that we have the power of compulsion over their lives.

But if we did believe in our students then we would be quick to entrust them with the freedom and responsibility to govern their own educations. We would realize that it is unnecessary, and even harmful, for us to require all students to learn to read at an early age, to give but one example. We would realize that if we took the responsibility to provide several different avenues for learning to read, and made sure that they were open to students without penalty at any age, then students would learn to read if and when they decided it was appropriate - the best possible time. Some might learn at age four, others might not feel the need until age 25, and others might live happy, productive lives without ever learning to read. To insist that all people must learn to read at age six because we know it is crucial to their lives and because we're afraid they will fail to realize the importance is to blatantly display our lack of confidence in the judge-
ment and self-directing powers of students. It is also, as I have tried to show, to fly in the face of a substantial body of philosophy and psychology which makes our assumption of omniscience highly questionable.
FOOTNOTES

Chapter I

1 See, for example, John Hospers' account of realism in his AN INTRODUCTION TO PHILOSOPHICAL ANALYSIS. Englewood Cliffs, New Jersey: Prentice-Hall, 1961.


13 See, for example, Timothy Leary's THE POLITICS OF ECSTASY. New York: Putnam, 1968.


Chapter II


4. See, for example, Patrick Suppes' ASPECTS OF INDUCTIVE LOGIC. Amsterdam: North-Holland Publishing Company, 1966.


10. William James, op. cit.


17. Alan Watts, op. cit.


Chapter III


3 Arthur Koestler, THE SLEEPWALKERS.

4 HARVARD CASE HISTORIES IN EXPERIMENTAL SCIENCE.

5 Polanyi, op. cit.


7 Polanyi, op. cit.


Chapter IV


2. Ibid., p. 12.

3. Ibid., p. 13.


Chapter V

1 See, for example, Brendan Maher's PRINCIPLES OF PSYCHOPATHOLOGY. New York: McGraw-Hill, 1966.


6 See, for example, L.S. Rubin "Pupillary Reactivity as a Measure of Adrenergic-Cholinergic Mechanisms in the Study of Psychotic Behavior." J. NERV. MENT. DIS., 1960, 130, 386-399.


10 Heron, "The Pathology of Boredom." SCIENTIFIC AMERICAN. January, 1957.
Chapter VI


6 Weiss, "Central vs. Peripheral Factors in the Development of Coordination." RES. PUBL. ASS. NERV. MENT. DIS., 30, 1952, Chapter 1.


9 Hubel and Weisel in BASIC READINGS IN NEUROPSYCHOLOGY, R.L. Isaacson (ed.).

10 Floyd Ratliff, "Inhibition Interaction and the Detection and Enhancement of Contours." In SENSORY COMMUNICATION, W. Rosenblith (ed.).


12 Floyd Ratliff, op. cit.

13 Ibid., p. 53.

14 Ibid., p. 170.


Chapter VII


5 Jerome Bruner A STUDY OF THINKING. New York: Wiley, 1962. and STUDIES IN COGNITIVE GROWTH.

6 Tolman, PURPOSIVE BEHAVIOR IN ANIMALS AND MAN. Appleton-Century-Crofts, 1932.


8 Newell, Shaw and Simon in READINGS IN THE PSYCHOLOGY OF COGNITION.

9 Arthur Koestler, THE ACT OF CREATION.
Chapter VIII


2 For example, John Fowles, op. cit.
   Albert Camus, op. cit.
   William Barrett, op. cit.
   Jean Paul Sartre, op. cit.
Chapter IX


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