Learning and Intelligence

Conversations with Skinner and Wheeler

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IRISH ACADEMIC PRESS

1995

Introduction

This is a book for teachers, at least for some teachers; teachers, perhaps, like the writers themselves, who found formal courses in learning theory generally incomprehensible but were still curious as to how and why their own students learned or didn't learn. Pavlov, Watson, Thorndike, Hull, Guthrie, Koffka, Köhler, Wheeler, Skinner – all seemingly a flood of S's and R's, mazes and cages, force lines and arrows.

And then there is the question of intelligence. Is it genetically acquired or is it nurtured in environments? Each half generation raises the question anew as if it had never been asked before. Is it a serious scientific/philosophical question or is it actually a political question? In any case, it is not to say that other readers might well be interested.

At least the writers were subjected to courses in educational psychology which conceded the potential importance of studying about intelligence and learning. One wonders whether contemporary teacher training programs still offer students the same opportunity. The writers would not seriously object to persons other than teachers reading this book. Anyone interested in change in behavior might find use in these ideas.

As research students of Professor Issac Noah Thut at the University of Connecticut in 1959, the writers rather brazenly decided to confront the problem of learning and intelligence directly. Ernest Hilgard, in the introduction to his classic text, *Theories of Learning* (1948) had suggested that all learning theory fell into one of two classes: atomistic, in which learning was parts to wholes and holistic, in which learning was wholes to parts. B.F. Skinner's behaviorism was prominently featured as an atomistic theory. Among holistic theorists Hilgard had devoted an entire chapter to Raymond H. Wheeler, whom he described as the first American gestaltist. Why not phone a specialist in each category and request an interview. Simple enough. Calls were made and, naïvely, the writers were not surprised that the then 57-year-old B.F. Skinner, famous already but not as famous as he was to become, and Raymond H. Wheeler, at the time 67, somewhat famous then, yet more so than he is now, agreed to allow the writers to visit them, ask questions and tape-record an interview.

The interviews were as revelation to the writers. Much of what had been obscure and dense in print came to life for them in the personal and verbal context. Both Wheeler and Skinner had agreed to the interview if they had assurance that the material would be shared. And shared it has been. Literally thousands of students and teachers have heard the tapes since they were originally recorded. Requests for the loan of them have been received from all over the United States, as well as in Great Britain and Ireland, and continental Europe.

And so, in the Spring of 1959, the writers set off for Cambridge, Massachusetts, where they were greeted by a somewhat bemused Skinner in his cluttered office in the basement of the William James Building at Harvard University. If at any time he was flabbergasted at the audacity of the two graduate students, he never showed it. He patiently awaited the setting up of the equipment, the preparation of contents from books and note-filled briefcases, the moving of chairs in his office. He set no time limit, responding to questioning until the tape reel emptied, and then continued to discuss his views for another half hour at least, before inviting the writers to his home in Cambridge for tea, served by his wife, in his back garden beside the empty swimming pool.

During the drive from his Harvard office to his home, the conversation, begun in his office, continued and Skinner described his conviction that humankind had been under the influence of three major authority systems during what might be called "authority epochs". The first of these he called the "epoch of antiquity", in which persons looked to magical forces in nature for authority. Control was in mystical mountains, sacred lakes, animals and gnarled oak trees. He dated this period from earliest history until 4000 BC. The second epoch, which he described, was the "epoch of the Middle Ages", peculiarly dated from 4000 BC until the 17th century. Authority was in God, as represented by the Church. The third was the "epoch of Democracy" in which personkind looked to one another for authority. He dated this from the earliest days of the Enlightment until some time in the present century.

In his view, the "epoch of Democracy" had also passed. All three epochs remain, but not as dominant modalities. In that there has always been some form of control, Skinner speculated on what would be the next. Would it be pharmacological, a pill in a community's drinking water? Would it be physiological, an electrode inserted into the central nervous system? Would it be genetic manipulation or electrical/chemical balance alteration in brain cells?

He was certain that total behaviour control was imminent (5 to 1000 years?). Would it not be preferable to have personkind modified by means of the science of behaviour, whereby there might be choice through intelligence. A large part of Skinner's later writing and lecturing dealt with these critical issues. It was in the science of human behaviour that Skinner saw a path to the solution of the problems of humankind and the global environment.

Skinner had the opportunity to hear his own interview twenty years later. While visiting Rhode Island College in Providence, Rhode Island in 1981 where he spoke at a colloquium on the topic, "Is There a Philosophy of Behaviorism?", he recalled the 1959 interview and requested the interviewers to play it for him. He sat in the lounge of the philosophy department attentively listening to the original interview with dozens of academic spectators watching. When the tape ended, he looked up and said to the writers, "I haven't changed very much, have I?" They were relieved to be able to say, "No, Fred, you haven't."

Two weeks after the original Skinner interview, the writers travelled to Babson Institute of Business Administration, now Babson College, in Wellesley Hills, Massachusetts to visit R.H. Wheeler. The interview took place in the living room of Wheeler's home preceded by a visit to his office and a personally conducted tour of the Babson campus.

The writers were surprised at the time to learn that Wheeler had been, and continued to be, engaged in an extended period of research developing data and theory relating to world weather cycles and human behaviour. He indicated that a portion of his income was derived from the utilization of data from the study of weather cycles for prediction of business trends and that he had worked at Babson primarily to sit in on meetings of a think-tank which prepared forecasts of business trends for a Babson monthly newsletter servicing business subscribers.

Wheeler, therefore, was somewhat surprised and pleased that the writers were there to query him about his original work as the founder of organismic psychology. As he warmed to the interview he became genuinely excited. He laughed often and seemed interested to reconstruct ideas which had interested him twenty five years earlier. There was little question of his continued commitment to his earlier thinking.

The writers had been interested to note that, while Hilgard had devoted a whole chapter to Wheeler in his 1948 edition of *Theories of Learning*, he had been all but exorcised from the 1956 edition, the discussion of his work having been reduced to a footnote in chapter 7, "Classical Gestalt Theory". They wondered why.

In spite of the simple fact that Wheeler seemed to have moved from his earlier interests and, unlike Skinner, had not undertaken experimental verification of his work, they continued to wonder why.

Hilgard (1964) suggests that "research on or related to the position (Wheeler's) was no longer sufficient to call for a new chapter." He asked

> Does this mean that the ideas which seemed so fresh when Wheeler and Perkins presented them in 1932 are valueless in 1964? Not at all; it means that something was wrong with the manner in which the ideas were developed, so that strong contemporary defenders are not to be found.
>
> Hilgard (1964), pp. 65–66

Further detail regarding Wheeler's removal from the various editions of Hilgard's text can be found in the appendix. The writers have always felt that Wheeler's experimental work with "hot and cold rats" described in the 1959 interview, had proved an embarrassment to his colleagues as he flew in the face of scholarly "correctness" in his defence of Lamarck's principles of heredity. It was reported in a then-contemporary release from the morgue files of the University of Kansas that, "Dr Wheeler's findings ... have not made him particularly popular with members of the history staff at the university". Mendelian/Darwinian thinking on heredity and evolution had come to dominate academic thinking even though there had been an enthusiastic defence of Lamarck's position on heritable characteristics. Cannon (1959)

Wheeler claimed that self-initiated physical changes in organisms would be passed on to ensuing generations. In the light of contemporary scholarly belief, this might have proved embarrassing. Stephen Jay Gould, in a June 1994 conversation with the writers, dismissed any possibility of usefulness in Wheeler's faith in Lamarck. "He was just wrong", Gould stated.

Wheeler's later weather cycle research might have also alienated his academic fellows. In what has seemed to the writers as an attempt at theory on a grand scale, Wheeler, in an ambitious effort to relate historical epochs with weather cycles, was probably the object of derision by other academics. It is suggested that the Babson business trends newsletter had enough faith in Wheeler to bring him to the institute and support his research activity. One is reminded of the devotion shown to Buckminster Fuller by international influentials. It was almost as if they were saying to themselves, "This person may be a little idiocyncratic, but suppose he's right?"

A third factor in the loss of interest in Wheeler may have been in the personality and temperament of the man himself. Hartman (1974) notes that psychologists representing alternative positions found gestaltists, among whom he included Wheeler, personally difficult to deal with as well as flouters of conventional practice. Wheeler was quick, fanciful and spontaneous in his thinking. He probably became bored with an idea as soon as he expressed it, however bright and promising the ideas might have been. Unlike Skinner who was always the detail person, even finding it necessary to pursue an idea to conclusion literally inventing the necessary technology. Wheeler, as in his theory of learning, was interested only until he had obtained insight. For him, insight was sufficient. Verification was incidental. Is there any wonder that academics found Raymond Wheeler too whimsical for their taste?

Given the writers' primary interest in the study of learning theory and educational psychology, both interviews were structured so as to generate responses which would deal with issues related to questions faced by teachers and students. Therefore, the topics introduced into the interviews focused on these items: the nature of man/person, intelligence and individual differences, the learning process, memory and forgetting, and evaluation of learning.

The juncture at which the interviewers introduced the questions dealing with the topics varied from interview to interview. In each interview, however, all of the topics were addressed so that the reader would have straightforward access to the contrasting points of view of the psychologists.

The character of the interviews reflects the theoretical base upon which each of the interviewees constructed his psychology. The interviews are recorded here in their entirety, including diversions from the central interview themes as they more fully represent the views of Skinner and Wheeler.

In addition to the interviews themselves, the writers have added commentary based on their own study and experience, in effect, a second conversation. Further, a review of Skinner's and Wheeler's writings was undertaken so that specific reference could be provided to the publications which treat the points raised in the interviews. These references are supplied so that the reader may readily locate readings which would extend the material included in the interviews. They constitute a rather detailed annotated bibliography of the relevant sources. While the Skinner material should be easily obtainable in any good library, the Wheeler sources may be somewhat difficult to locate.

Skinner's first text, *The Behavior of Organisms; An Experimental Analysis*, was published in 1938. Since its publication, Skinner has produced eighteen books. Three of these eighteen are autobiographical, and one a commentary on old age, as well as *Notebooks*, a volume of selected noted edited by Robert Epstein. In addition, he has produced a steady stream of journal articles and lectures.

Wheeler's first book, *The Science of Psychology*, was published in 1929. This publication was followed by four books as well as many journal articles on an extraordinarily wide range of topics. R.H. Wheeler died in 1961; hence, the interview included here is probably the last interview in which his considerations on learning were addressed.

An extended bibliography of all of the texts mentioned in the book is also included. For every idea and controversy mentioned readers are provided with at least an entry source of follow up material.

The writers hope that the readers will find invitation to join in the conversation as they have themselves. Multiple readings of the interviews have seemed to accentuate the differences in the two psychological positions. Surprisingly, extended readings also seem to suggest that Skinner and Wheeler are describing similar phenomena using different metaphors.

And remember, that while the writers have done all that they were capable of doing to assure the accuracy of the reporting and the respectability of the reactions, they remain school teachers, not scientists nor historians. As such, they assume responsibility for all that might be found here.

I. Biographical Sketches

Biographical sketches of B.F. Skinner and R.H. Wheeler are included here to provide some general information about the psychologists, the schools of thought they represent, and some contextual elements for the interviews and the responses to them.

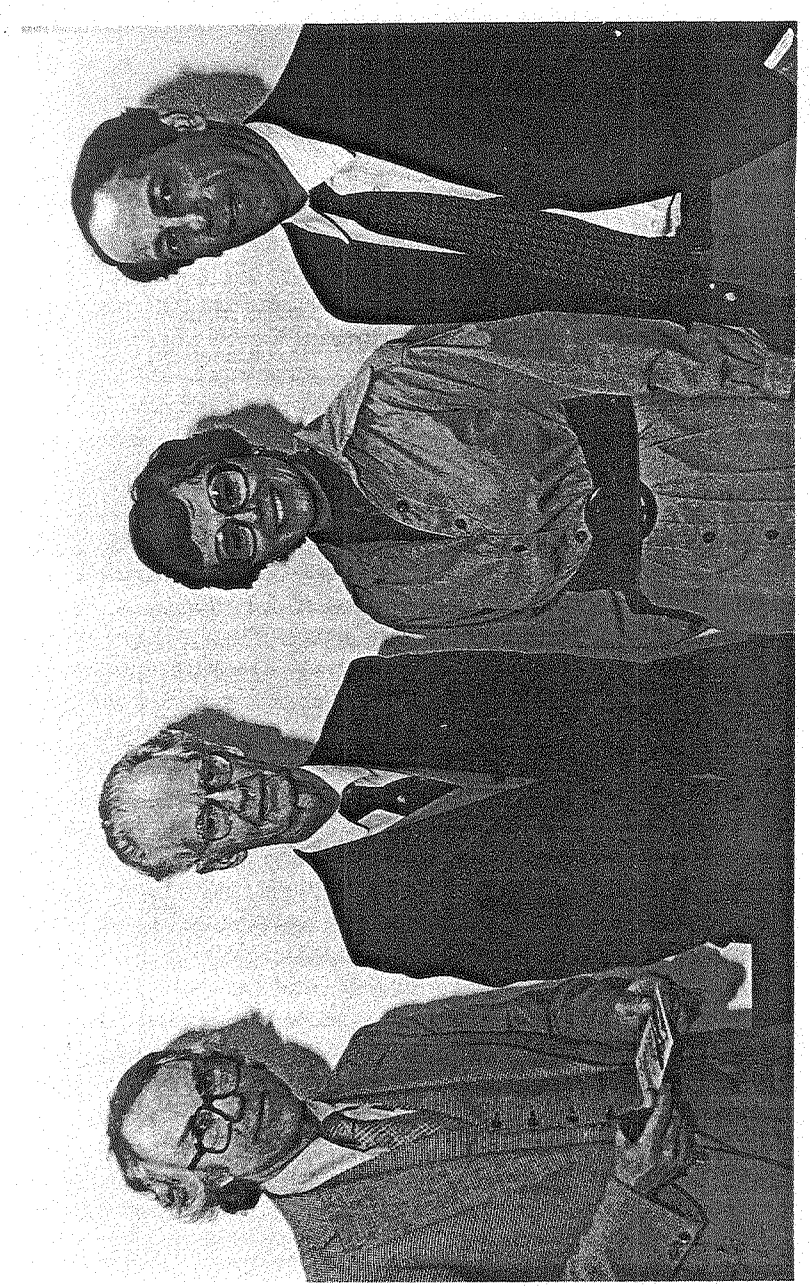
Skinner published his own three-volume autobiography; hence, many details of his life are readily accessible. The writers have made use of Skinner's personal abridged biography appearing in Epstein (1982), originally written for E.G. Boring and G. Lindsey (1967, pp. 387–413). Wheeler, less well known than Skinner, left no autobiographical notes, details of his formation as a psychologist, or of his later years. The data reported here were obtained through librarians and archivists at the college and universities where Wheeler studied and was employed as well as through personal interviews with former colleagues.

It is intended that these sketches will introduce the reader to the scientists, their thoughts, and their place in the course of development of western psychological and social development.

SKINNER

B.F. Skinner's own life was a prime example of an individual in response to the contingencies of reinforcement which shaped him. "Why?" would be to ask the non-behavioral question. No one controller directed his shaping. No controller conceptualised the operant movement of his growth. Yet, his life did seem a product of the major contingent possibilities. On a world scale, Skinner's life was played out within a range of perhaps ever narrowing possibilities.

To believe his own autobiographical perception, Skinner grew up in a Norman Rockwell world of snapshot, not video, images of life in early 20th-century America. What does he remember selectively? He is not impressed with his forebears, especially on his father's side. He did seem "proud" of his ancestor, Captain Potter, who had fought under Washing-



B.F. Skinner at the colloquim at Rhode Island College, Providence, R.I., USA, in 1981. Others in the photograph are (l.-r.): R.W. Houghton, M.T. Lapan and L.E. Alfonso.

III. Comparison of Views

What is to be made of these interviews, these conversations on learning and intelligence? The writers had approached the task with five basic questions.

1. What is the nature of personkind?
2. What are intelligence and individual differences?
3. How do organisms, especially human organisms, learn?
4. What is memory? Why do people forget?
5. How is learning to be evaluated?

Hilgard (1948) had committed to the idea that learning theory fell into two classes based on the broad notion that learning tended to be holistic, that is, occurring from wholes to parts or atomistic, parts to wholes. It was originally assumed that Skinner, the radical behaviorist, was atomistic and that Wheeler, the organismist, was holistic. Hilgard continued to use the atomistic/holistic dichotomy through Editions II (1956) and III (1962) of *Theories of Learning*. Hilgard and Bower (1966) ceased using this form or organisation. Wheeler was eliminated, in any case.

In this section the writers will attempt to describe how each respondent in the 1959 interviews answered the questions.

SKINNER

1. *Nature of Personkind*

Skinner assumes that "we are only dealing with biology in a very broad sense". Further that ... "everything that man does is done by him as an organism with, of course, a genetic history and that people will differ very much as their genetic history differs and with a personal history."

He comments that most of his research (at that time) had been done with "so called lower animals" but with the assumption that there is nothing capricious about their behavior. He assumes their behavior to be regular and that tends to be confirmed in his experimental activity.

2. *Intelligence and Individual Differences*

In this interview Skinner, while not responding to a direct question, says that the "difference that turns up in work and teaching is the speed with which people can acquire a new behavior and how well they hold it." In other words, intelligence is judged on how quickly a person learns, and how long does he/she retain it. In some individuals the new learning/behavior slips away too quickly for it to be able to effect future behavior.

With reference to testing of intelligence he says, "... everything is in terms of observable behavior. You have no other information about people." "Individual differences are observable facts," Skinner says. They cannot be explained by saying that brains differ.

"No one has ever shown any correlation between behavioral property and a neurological one which would explain the so-called individual differences of an intellect or traits of character."

He goes on to say that individuals are born with different endowments, "... some capable of high development ... some probably not."

He strongly states that many seeming differences are merely the results of "... bad education or a bad environmental history", and that much difference is a matter of an individual merely having missed out on something in school or in his/her environment.

3. *Learning*

Skinner defines education/learning as change in behavior. "That's all it is and all it ever has been."

He sees the process of learning as occurring within an environment of interacting stimuli and responses, deliberate and indeliberate. Behavior changes as organisms responses to perceived stimuli in a contemporary environment are reinforced (rewarded) in a series of sequential operants in a direction toward new behavior.

This can be random or it can be directed. Control, that is the manipulated use of authority, is accomplished as responses desired (to the authority) occur. These initially small responses are immediately and positively reinforced. These small steps (operants) successively reinforced, move the respondants behavior in the direction of the desired behavior.

Skinner saw there to be no "freedom", for individuals as individuals are products of the contingencies of reinforcement in the life experience, and no dignity, in that credit could not be taken for behavior that could have been no other. (See Appendix D)

4. *Memory*

Skinner states in the interview, and confirms twenty years later, that he cannot manipulate the neurons in the brain of a person and hence, until he can do so, he is not interested in the inside of organisms in the sense of the nervous system and other internal mechanisms. This is not because they are not important, but because one cannot do much about them, especially in the living and intact organism.

He says that "... when I teach a child something today and discover that he knows it tomorrow that something survived overnight inside the child."

What survived is "... a changed child, a changed organism, partly in the brain and (he supposes) parts of the body." Such changes may have been different as a "... result of what happened to him yesterday."

The child is different and, in the observation of his behavior, the child still knows what he was taught yesterday. He says that if he knew how to use the "... storage mechanism" he would "... look into it, but (he) can't." All he claims to be able to do is "... put something in today and predict it will be there tomorrow and I can do that in light of my past experience." He would welcome information about brain physiology and would make

use of it, as available. He simply rejects dependence on what he terms "... a conceptual nervous system, a nervous system that you would infer."

To appeal to these "phoney nervous systems hinders a "'lawful description of behavior.'"

5. *Evaluation*

In a Skinnerian educational system there would be no marks given. None would be necessary as students would proceed through programs of instruction mastering each in turn for Skinner sees "everything in terms of observable behavior. You have no other information about people."

"All tests come down to sampling behavior. Some sample it effectively, some don't."

With a teaching machine, no tests are needed, he says. When a student gets through the program of material there is no point in testing him. The mark, if one insists on mark, would tell how far the student has proceeded. It is to be assumed that records of students' progress would be in terms of programs completed. When a program is completed Skinner says, "You know it all then."

Work done is work done, it appears.

WHEELER

1. *Nature of Personkind*

Wheeler's answers to the writers' initial questions are interesting in the way he accepts their naïveté and covers them without hurting the dignity of the questioners. "Why, yes, Ray" he says, patronisingly "(people) are at the upper end of a biological continuum." He knows immediately that if the interviewer had prepared thoroughly, he would have known the wrong question had been asked.

Wheeler quickly goes on to make the question more sensible by saying that "... there is nothing basically different in principle between different levels of the animal kingdom in as far as the basic laws of their constitution are concerned." He then says, "... all organisms, from the simplest to the complex, obey or follow these organismic laws some part of which *you have in mind*." Wheeler was being polite, but, of course, the interviewer had failed to recognise the primacy of the laws.

In fact as he would later find out, the organismic laws have primacy in not only a biological continuum, but in matter, and in all things. The organismic laws in Wheeler's view eliminate the ancient dualism of mind (organic) and matter, by establishing the primacy of the laws which anticipate everything.

2. *Intelligence and Indiviadual Differences*

"The criterion of an intelligent response is being able to take the shortest route," Wheeler begins. He is, of course, referring to his law of least action, the law of parsimony, and that intelligence is related to the organism's ability to respond to the natural guiding momentum the law provides in solving problems, from rats in mazes, to mathematicians solving complex equations.

"Intelligence is to be equated with insight," he says in agreement with the questioners' probe. "The same thing." It is to be remembered that Wheeler also equates insight with learning. Insight, to him, is the seeing

something whole. Would he then mean that intelligence is seeing many things whole or perhaps everything whole?

"Intelligence grows. I don't believe in native endowment." He was to say later in a separate conversation that you cannot sample any such thing as latent intelligence any more than one could sample the essential water by dipping a cup in a flowing river. He is convinced that organisms are not endowed with a fixed intelligence "in the germ plasm".

The three causal factors in intelligence are heredity, but far less than most American geneticists (at that time) were willing to admit, laws of growth and engineering, and the third, the environment. When he says environment he is not simply referring to socio-cultural influences, but also physical influences such as barometric pressure, temperature and other natural phenomena.

"The only way to measure intelligence is in achievement," he would say. "Anything on the order of potential is never measured. The only thing you can measure is action. It is kinetic energy and not potential energy. Potential energy, as he seemed to understand it, had no identity.

Individual differences, to Wheeler, are due to the laws of heredity, the laws of growth and the environment. "The laws work together to produce an organism. You can't have an organism unless you have all three."

Wheeler sees the genes as merely setting energies in motion. It is strikingly influential in his scheme, for they forge and direct the genetic energies in particular and individualized ways to produce uniqueness and specificity in organisms.

He also places great influence on environments, particularly the natural physical environment determined by climate, weather and geography.

3. *Learning*

"Learning is a succession of inventions which we call the growth of insight, the growth of understanding, the growth of intelligence and it is anything but mechanical. It is anything but conditioned. The only place in the picture where conditioning comes in is the stimulus has to be there to challenge the person to stir him up, put him in a state of imbalance"... so that he will apply his own energy along the line of development of some kind.

Wheeler has taken the trouble to eliminate dualisms from his system, always by means of incorporating the dualisms into a prior system of natural or organismic laws. He speaks of a low level intelligence operative prior to stimulus events in a particular environment. It is almost a metaphoric God having turned on the power switch and the universe is humming, prepared to provide energy on call.

An organism is confronted with a stimulus. The organism draws on the energy supply within its system to accomplish a solution to the problem engendered by the stimulus. It might be supposed that intelligence is a factor of the efficient means with which the organism makes use of the organismic laws to solve the problem, to mature, to learn, to gain insight, to grow – any of the word descriptions Wheeler uses to refer to the same phenomenon.

It's a "... matter of development, a matter of growth. It's a matter of maturation. It is an unfolding. It is a development. It is a series of discoveries, a series of emergencies, a series of developing of new capacities, new achievements." He is like a writer of fiction, a greeting card verse writer, a field naturalist in his description of learning, but he can be more specific.

"... then, he (the learner) comes to the ... problem." In this case its a rat in a maze. As he passes through the maze, not seeing the problem whole, the rat solves the problem of each small box through reliance on organismic laws and natural energies. "That's why his performance is trial and error because he can't see the whole thing. It is beyond his comprehension and he does solve, without any trial and error, separate little problems he confronts in succession by the simplest means that he can."

Wheeler's concept of *pace* is critical in learning, for an interactive exchange of maturity, or growth, together with active experience are key to learning.

While Wheeler does not say this, the writers might venture that the organism is in self-conscious consideration of experience. The product of such interaction is small insights and the solution of small problems which has been driven by the necessity of seeing the problem whole. See Appendix C and D.

4. *Memory and Forgetting*

Wheeler is consistent and specific in his view of remembering and forgetting. To remember is to return to time/place in as literal a way as possible. Because of the primacy of the whole, total recall is impossible. People are missing, sensory data are missing, unique phenomena of remembered moments may not find replication in the present. The organism is left with an imperfect recreation of experience. "... if and when you have confronted with enough similarity in the stimulus pattern to generate it", memory occurs.

There is no trace necessary at all. It is just re-creation of experience, not completely, because you do not repeat the situation completely. "We may partially re-create experience by means of language. Now we have one means of re-creating original situations without going back to them physically. There is language. Here is the nearest that I come the behaviorist. We have a large part of our previous environment still existing symbolically in our language so we think of those words like vacation or mountains or Mount Shasta that takes us back there."

It would seem that forgetting is related to diminished stimuli necessary to the re-creation of the experience.

5. *Evaluation*

One can only presume that Wheeler would test learning in behavior. The rat solves the problem of a path through the maze. The golfer scores par on a hole, a child performs on the piano. But that is never quite clear with Wheeler in the conversation nor in the writing. Insight is to be equated with learning, he says over and again.

"Oh, I see it now!" one might explain. Like Henry Higgins says of Eliza Doolittle, "By George, I think she's got it!" Eliza speaks a sentence after the fashion of a posh lady. She has perhaps "learned" to imitate the language pattern and inflection of another person. She has not replaced her own learned one. She has accomplished the behavior once. Has she learned? The connectionist would send her off to practice and reinforce her muscle memory. The behaviorist would continue reinforcement of the new behavior and through withdrawal of reinforcement extinguish the old behavior. Wheeler is satisfied as is. The organism will be able to sustain the change as long as it maintains the relationship between growth and action inherent in the pacing process.

To Wheeler one might "have it", with understanding but might not "behave it" constantly. For him one will have learned, however.

Wheeler surely makes a genuine distinction between mindless memorisation, wherein one might reproduce a given word, sentence or stanza, and true insight. In fact, the blind, practised ability of Eliza Doolittle would hardly qualify as insight for him. Then what would constitute acquisition of insight and how would it be truly recognised? What would be the difference between pseudo-insight and fully achieved insight? How could it be determined in some cases without regress to conscious/unconscious apologetics? Evaluation for Wheeler might well be a complex undertaking indeed.

IV. Relationship of Theories

Skinner makes his opinion of gestalt, or more precisely, the particular form of gestalt called field theory, perfectly evident in the interview. "I don't see anything in field theory." He concedes that perhaps he has not been taught to "look closely", but "I have never felt they have done anything but name some problems and these problems are of interest to us, but then solutions are not because they tend not to be real solutions." He says that, "We can teach a child to observe, to attend to details, to organise materials" without field principals. He goes on to say that his idea of repertoires may be something like "continuous field" but do not appeal to "forces operating in these fields."

Presumably he suspects a form of vitalism in gestalt thinking, perhaps like Wheeler's notion of energy or "low intelligence." Actually Skinner does not seem to have a need for any extraneous psychological thinking in his radical behaviorism. Perhaps the great weakness in Skinner is that his system explains everything. There is no falsification possible.

But so does Wheeler's. Wheeler, when he does refer to other systems, tends to regard them as "the others". He makes little distinction between behaviorism and connectionism but rails against psychologies riddled with the problem of dealing with dualisms, and the necessity for mechanistic explanation of phenomena.

And yet a comparison of their views generates many interesting similarities. Not surprisingly, both regard human beings as representing a point on a biological continuum. Each agrees that organisms tend to respond regularly. Wheeler, however, develops his Laws of Human Nature which hold primacy in the behavior of organisms.

Neither is sympathetic to any concept of "fixed mind". Both feel that intelligence is a dynamic concept manifest in behavior, and, growth is possible. Both are optimistic, in terms of the human organism's potential to change, learn, and grow.

There would seem to be critical difference between Skinner and Wheeler when comparison of learning theory is considered. It begins in attitude of world view. Skinner is concerned with authority and control. He has the

sense that personkind has always been controlled, has always been shaped by contingencies with no freedom, by which he means choice or will, and no dignity, in that, with no choice, people become products of the stimulus/response environments in which they grew. He therefore urges populations conditioned to moderation, through cooperative planning, as preferable to control inflicted by malevolent external forces. Radical behaviorism offers the learning theory necessary for that control. It suggests deliberate choice of contingency environments and selection of reinforcable behaviors. Undesirable behaviors would become extinguished by deliberate elimination of reinforcement. In its pure form, it might be Skinner's *heavenly city* but hellish to many others, especially those who, to Skinner, represent highly individual, selfish personalities, for whom life in a cooperative society would be a prison.

There is none of this control emphasis in Wheeler. From 1938 until the end of his life he was interested in his world cycle explanation for global behavior of populations, but he was not interested with respect to controlling a world condition. Rather, he was interested in understanding it, and perhaps, through such understanding, adjusting to it, deriving such benefit as possible and reducing the harm by anticipating threat. Wheeler was that consummate gestaltist, a total world ecologist, seeing the interrelatedness of everything, not only in the world, but in the universe. At the end, Wheeler was overwhelmed, by his almost mystical, though not superstitious, fascination with a dynamic, organismic view of reality.

If one believes in emergence, in growth, in maturation, in unfolding, in discoveries, new capacities as explanations of learning, it would seem doubtful that he would be greatly concerned with control.

There are, in spite of differences, similarities in their learning theory. It seems to the writers that Skinner's series of operants, as the intermediate units between defined behaviors, are very close to Wheeler's "small discoveries". Skinner's whole is new behavior envisioned and defined. Wheeler's whole is in the mass action or energy which derives out of his organismic laws. To Wheeler, the future is in the present, and the future is in the past, in the sense that, forces set in motion (an apple dropping) have an inevitable conclusion. Change can occur to modify the conclusion and might, with strategic awareness of the totality, and with selective intervention. (Someone catching the apple in flight, a hurricane wind disturbing the path, a huge suction slowing and stabilising the apple's descent, Magic.)

It is not to say that Skinner has no sense of large wholes, and more complex phenomena that he might observe or measure. In fact, one could conceive a total universe of interactive stimulus/response phenomena,

operating to shape individuals and matter. In later papers Skinner suggests a Darwinistic theory of survival of the behavioral fittest, selection by behavior, with himself as the twentieth century Darwin. He is not so blind as to deny that there may be micro-behavior, subtly effective stimulus/response outcomes (as in so-called body language). He is concerned with keeping things simple, content with observation or regularised behavioral outcomes that satisfy rather traditional empirical strategies. Build, from what you don't know, to what you know satisfies the experimental Skinner. Beyond that, who is to say? No one who ever met him (or read his autobiography, for that matter) would deny a romantic hero version of the great man.

V. Inference for Classroom Teachers

Classrooms have always been extremely inefficient places. They have often been places where no one had any real idea of what changes were desired in the students, little consciousness of the values and hence behaviors to be engendered.

Education is involved with two major concepts: values cum behavior, that is, value driven behavior, and change. Without a clear vision of what behaviors are desired and little modern knowledge of change methodology, teachers are at some disadvantage. They muddle through without much confident control using essentially vestigial remnants of seventeenth and eighteenth century faculty psychology or imperfectly derived leftovers of Lockeian and Herbartian apperceptive psychology.

What would a Skinnerian classroom look like? The teacher would be armed with a specific knowledge of behaviors to be reinforced and behaviors to be extinguished. All activity in the school would resemble *Walden Two* so that contingency environments would maximise the naturally reinforcing options and the human interaction would be generative of selected reinforced and extinguished behaviors. The classroom would be a technologically modern environment of computers and multi-media wonderment. All data would be available on call by the teacher or individuals on internet. There would be no omissions and no mistakes. All the epistemological stuff would be painlessly and parsimoniously transferred. Depending on the level of sophistication of the media, teachers might stimulate dialectical activity between students and students, students and teacher, students and machines, teacher and machines, machines and machines. Maybe there would be no teachers at all; too inefficient, too insufficient.

The writers are serious here. But does Skinner have usefulness to teachers inefficient and insufficient as they might be? Skinner says if you want positive change, recognise and reinforce small changes in behavior that move toward desired behavior. Negative reinforcement, aversive in all its complex forms, from physical beatings to emotional beating can *prevent* behaviors, but will not develop positive behavioral change. Skinner says arrange the contingencies so that students will be operating in naturally

reinforcing environments. Skinner says make the operant units small enough so that students always "get it right". Skinner assumes no natural preclusions to learning in any child. All children can and will learn if the circumstances are right. Skinner arranged (or selected) contingencies of reinforcement that generated his own personal fulfilment. Learning and growth were mostly desired and painless for him because he controlled the order and pacing of his growth, or so he claimed. Teachers can arrange these things for students. Too often schools and procedures are the opposite of Skinner's methods. They are painful, unpleasant, unreinforcing, menacing, selecting places where ill defined elites emerge and ill defined rejects fail. Skinner would wish for better.

In consideration of what Wheeler and gestalt thinking generally might provide for classroom teachers one must remember that it has already had its major impact. One might as well inquire what ever happened to progressive education as to what ever happened to gestalt. Hilgard has suggested that there are three possibilities: 1. It has been disproved and rejected; 2. It has been absorbed; 3. It has been neglected.

Cremin (1961) felt that progressive education (and hence, many gestalt principles) have been absorbed into standard educational practice. Hilgard agrees and cites many examples: Discovery method is a gestalt idea. Project method, much of child development theory, holistic reading instruction, study skill (SQ3R) techniques, the concepts of motivation, insight, of unfinished phenomena stem from gestalt. American style core curriculum, that is, planned interdisciplinary studies is gestalt inspired. Hilgard also suggests that because Wheeler moved away from his interest in organismic psychology, and that neither he, nor any followers, continued with confirming experimental work, Wheeler's ideas fell into neglect. Hilgard was particularly impressed with the Wheeler concept of pacing. There is much in Wheeler to be of use to modern teachers.

Wheeler would say, provide stimulation to excite the necessity to action on the part of students toward the solution of problems. Wheeler would say, encourage and allow time for maturity to interface with action, as in his concept of pacing. One is always behind the other and growth can result only as the two, maturity and action fuse. Wheeler would therefore say that patience is necessary in students and teachers. Insight cannot simply be called out. The stimulus conditions can create an environment for insight to occur, but cannot guarantee it on demand.

Wheeler would say drill and practice without insight, without maturity is wasted time. Wheeler would say that the experience of insight is so

generative, so satisfying, it creates empowering access to natural energy toward seeking additional insights.

Wheeler would say that learning is easy and natural if it is attuned to the natural law of particulars and individuation arising out of mass action. Learning is, in such cases, the unfolding of inevitable growth. Wheeler would say, "Read my books. Allow the ideas contained therein to mature and relate to your personal action and experience. Skinner would probably say, as they all used to say in Susquehanna, Pennsylvania, "Hogwash!"

APPENDIX A

Notes on Source Material

SKINNER

As previously noted, it is the intent of the writers to provide some assistance in locating sources which will further develop and explain the content of the Skinner and Wheeler interviews. Texts and periodicals which relate directly to the questions and issues raised in the interviews are identified here with a brief commentary on the content of the texts.

Complete bibliographies of Skinner's work – texts, articles, audio tape – are readily available. For example, Daniel Bjork's recent biography, *B.F. Skinner* (1993) contains such a listing. *Skinner for the Classroom* (1982) edited by Robert Epstein contains a bibliography of books and papers published by Skinner through 1981. Skinner's own texts usually contain a bibliography of his work through the publication date of the text under examination.

Skinner's high rate of productivity has resulted in the publication of a large volume of material potentially useful in furthering an understanding of the content the interview. The publications cited in the annotations include fifteen published works. The three volume autobiography, *Particulars of My Life* (1976), *The Shaping of a Behaviorist* (1979), and *A Matter of Consequence* (1984), have been included in the study as they provide personal references which illuminate Skinner's theory and proposals. They do not, however, deal with the content of the interviews as directly as some of the other publications. Individual journal articles and published presentations have not been included as four of the volumes included in the annotations are collections of papers and presentations largely published previously to their inclusion in these texts – *Cumulative Record* (1959), *Reflections on Behaviorism and Society* (1978), *Upon further Reflection* (1987), and recent issues in the *Analysis of Behavior* (1989. The items included in these four volumes provide a substantial sampling of Skinner's papers. The texts which were selected as most relevant to the Skinner interview are listed here in order of publication.