JOHN WATSON'S SCIENCE

by

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Remember, then, that [scientific thought] is the guide of action; that the truth at which it arrives is not that which we can ideally contemplate without error, but that which we may act upon without fear; and you cannot fail to see that scientific thought is not an accompaniment or condition of human progress, but human progress itself.

William Clifford, "On the aims and instruments of scientific thought"

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ABSTRACT

Psychology has always been concerned with its status as a scientific discipline. This concern was among the factors motivating John Watson (1878 – 1958) to found behaviorism as a replacement for the introspective studies of consciousness which then dominated psychology. Watson saw introspection as an unscientific methodology which had held psychology back from achieving its status as a respected natural science. This call towards the scientific was popular in American psychology, and behaviorism became dominant in American psychology until about the 1950s and 1960s, when the study of consciousness (although using different methods) again became popular. Even psychology after this 'cognitive revolution' is influenced by behaviorism.

As an aid to understanding Watson's science, historical context is provided by a brief discussion of the history of science and a more in-depth analysis of William James' *Principles of Psychology*. Time is also given to some brief comments on the nature of science and Thomas Kuhn's paradigms.

While John Watson was adamant in his belief that behaviorism was scientific and introspection was not, he was not always specific about what exact qualities were necessary for a science. An analysis of his writings indicates that he viewed reproducible results, objective and precise measurements (preferably obtained with instruments), shared definitions, and end goals of prediction and control as key aspects of a science. Watson stressed the practical applications of his behavior psychology in both his academic and popular writings. Behaviorism's focus was on

understanding humans in order to better to predict and control their behavior for the good of both individuals and society.

This work proposes that Watson's insistence on achieving recognition for psychology as a natural science and his goals of prediction and control are related. Behavioral psychology had practical applications, but would not be allowed to practice those applications unless psychology was recognized and respected as a legitimate science. Without that respect and recognition, psychologists would not be permitted to help design and guide the reshaping of society.

Chapter 1

INTRODUCTION

In 1913, John Watson declared that psychology

> has failed signally, I believe, during its fifty-odd years of existence as an experimental discipline to make its place in the world as an undisputed natural science ... The time seems to have come when psychology must discard all reference to consciousness. (1913b, p. 163)

Watson's solution was the creation of a behaviorally based, objective psychology. This conception of psychology, despite the limitation imposed by eliminating mental states as valid subject matter, had a strong appeal and came to dominate American psychology until the mid 1950s, when the study of mental states again became popular (Benjamin, 2007, pp. 55 & 196).*

This desire to be recognized as a legitimate science is present throughout psychology's existence. Historian Franz Samelson noted that "psychologists have always been quite concerned about the scientific status of their discipline" (1977, p. 274). The first psychologists, who mostly used introspection to study consciousness,

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* Since this is a discussion of broad movements and trends in psychology, there are few exact starting and ending dates. The roots of behaviorism predate Watson's landmark 1913 lecture (Benjamin, 2007, p. 143); even after the movement began to grow, it was not until the 1920s that behaviorism could be said to be dominating American psychology (p. 143). Somewhere around the 1950s and the 1960s, psychologists became dissatisfied with behaviorism and returned to the study of mental processes (p. 196), but the process was a gradual one, lacking an exact moment of origin.

held this goal; so did John Watson and the behaviorists, and so did the psychologists which followed. Each maintained that psychology was a natural science, although Watson was more outspoken and determined than most in insisting that psychology be granted the same respect accorded to the older and more accepted sciences.

If Watson believed that psychology deserved scientific respectability, and if he proposed behaviorism as the path to scientific respectability, then an examination of his writings should yield some understanding of how Watson defined a science. A consciousness-based psychology which relied on introspection had failed, so Watson gave psychology both a new subject and new methodologies. Watson objected to introspection both because of failures in the methodology and because of its exclusive focus on mental states. He saw the purpose of psychology to be prediction and control, and he valued the use of apparatus and laboratories for the increased objectivity they lent to psychological findings.

The problem

This thesis originated out of a desire to explore the concept of science. Since this topic is much too broad for any single work, I decided to approach it as a case study: how did this one particular scientist define science? I was able to combine my undergraduate study of psychology and history and chose the psychologist John Watson (1878 – 1958) as my focal point. Watson had been dissatisfied with the quality of science being done by psychologists, and had founded a new and more scientifically rigorous movement in psychology.

My discussion of Watson's ideas needed context: how do his values compare to those of earlier psychologists such as William James? James was one of the first psychologists in America. He defined psychology as the study of consciousness using the method of introspection. He believed that psychology was a science, although his references to the Soul and philosophy demonstrate that James' concept of science was different from Watson's concept of science.

John Watson deliberately wanted to emulate the older, more traditional sciences, such as physics and astronomy. A larger historical context was needed to provide context for how the development of psychology compared with these older disciplines. My discussion of the emergence of scientific astronomy is also an introduction to the concept of paradigms.

I quickly realized that although Watson was adamant about the scientific quality of his behavioral approach to psychology, he was not very exact about exactly what was necessary for scientific quality. By reading his books and articles, I attempted to identify the factors Watson believed necessary for a field to be scientific. In brief, these factors are: results which are reproducible across different trials and laboratories; terms with standardized meanings which hold across different laboratories; a preference for the use of apparatus, which yield more precise and objective results over unaided observations; a focus on prediction and control as the end goals of a science. This focus on prediction and control also allows for numerous practical applications of scientific findings. Watson also values internal validity over external; he shows a strong preference for highly controlled laboratory studies on isolated individuals.

Perhaps Watson's most famous single experiment was his successful emotional conditioning of the infant Little Albert. This one experiment, despite relying on a single subject, would form the foundation for Watson's theories of emotional conditioning. The Little Albert study is intriguing because Watson, who valued high scientific standards, managed to run an experiment which contemporary psychologists were unable to replicate.

My research lead me to another question: Watson appeared to not only be insisting that psychology should hold itself to higher scientific standards, but that psychology deserved some kind of general recognition as a science. This was intriguing: why should achieving recognition be so important? My thesis would not have enough scope to thoroughly address this question, but I was able to propose a reason. Watson saw the end goals of a science to be prediction and control, and he saw numerous ways in which psychological findings could be used to shape (and control) individuals. Perhaps he believed that psychology would not be allowed to fulfill its potential for control unless the field was publically recognized as a science, and psychologists as legitimate scientific experts.

While I was researching the history of psychology in general and John Watson in particular, I allowed myself to examine several very interesting and generally relevant topics: mental testing during the First World War, Thomas Kuhn's theory of paradigm shifts, and a very short introduction to the philosophy of science.

Mental testing is a fascinating part of psychology's history. Steven Jay Gould's *Mismeasure of Man* is a brilliant discourse of how repeated efforts to measure

intelligence have managed to appear scientific while hiding numerous fatal flaws. Mental tests are prime examples of how scientists' biases can (generally unconsciously) skew the experimental procedure so that the data supports the original bias. The content of the army mental tests were strongly biased, the testing conditions inconsistent, and the directions to the test-takers poor to the extent that, from a modern perspective, the testing results are thoroughly invalid. Yet the testing effort had a positive influence on psychology's recognized standing as a science, and there was a surge of requests for psychological testing in businesses and education.

Psychology has claimed to have undergone at least one paradigm shift – the so-called 'cognitive revolution' during the 1950s which was a backlash against the dominance of behaviorism. I desired to learn more about Kuhn's theories, and see how well they applied to psychology. Psychology fits into Kuhn's theories as a pre-paradigm science, a field which does not yet possess enough of an unquestioned and widely accepted approach for a psychological paradigm to exist.

I only briefly venture into the field of the philosophy of science, as the field is both large and generally the domain of philosophers, not scientists. I was most interested in the ideas of one particular mathematician and philosopher, William Clifford, and included a section on his concept of scientific thought as the guide to action (as most philosophy is concerned with 'that which can be known without any doubts,' this makes Clifford's ideas unique and more closely aligned with my focus).

Some comments on method

This was an exploration. My first sources were broad and provided me with an overview: general histories of psychology by Benjamin (2007) and Mandler (2007), and a brief history of science by Gribbin (1998). I quickly realized that if I was going to discuss one particular definition of science, that definition had to be placed (as well as I could) in an historical and philosophical context. Thus the inclusion of a brief history of science in general and psychology in specific, and my discussion of William James' *Principles of Psychology* (1890). The philosophy of science proved to be a daunting field, and I included only a small discussion.

As I narrowed my focus to John Watson and behaviorism, I studied biographies (especially Buckley's *Mechanical man* [1989], but I referenced Cohen's *J. B. Watson: The founder of behaviorism* [1979] as well) and Watson's own books and articles. Most of my research involved these biographies and Watson's primary documents. Watson was a very prolific writer, and I focused on the parts of his articles and books which discussed the nature of his behavioral psychology. I discuss two articles in great depth: Watson's 1913 Behaviorist Manifesto (1913b) and his report on Little Albert (Watson & Rayner, 1920).

As I read, I discovered new sources from the citations and references, and acquired those sources. In this way I found Franz Samelson's enlightening articles on Watson's Little Albert experiment (1980) and the impact of the World War One mental tests (1977 and 1979). I was familiar with Thomas Kuhn's theories from *The Copernican Revolution*, and now I read *The Structure of Scientific Revolutions* (1962/1996).

I had first found William Clifford ideas in J. Bronowski's *The Common Sense of Science* (1978a), although very poorly cited. After a bit of internet research I was able to determine the essay Bronowski had quoted, and acquire it. A discussion of Clifford's essay is included in the chapter on the nature of science. I also managed to find a small but highly relevant book review by Ralph Barton Perry (1928), despite the fact that the only citation information I had indicated that the review had been published in *The Saturday Review of Literature* (with no year or page information) and that a clipping of the article was in the Johns Hopkins University's special collections.

Chapter 2

HISTORICAL CONTEXT

Science (with an emphasis on physics and astronomy)

In order to understand the goals of the behaviorists, it is necessary to place them in context and to understand both the progress of psychology prior to 1913 and the then current state of the major natural sciences psychology wished to emulate. Fields like physics, astronomy, chemistry, and biology all predated psychology and, in the eyes of concerned psychologists, set the standard for what a legitimate science was.

"The successful model for the development of a science was physics. Psychologists tried as much as possible to conform to that model in an effort to raise their discipline's status within the scientific community" (Buckley, 1989, p. 80). It was Ernst Mach's concept of physics which would provide the model followed by the psychologists; Mach valued prediction and facts over theories. His methodology had a powerful effect even in his own well-established field of physics:

> It is difficult to realize today how shaky and dogmatic the fundamentals of the physical sciences were prior [to Mach], when some German textbooks in physics still implied that the meaning of concepts was to be sought on a higher, metaphysical plane. (Holton, 1993, p. 4)

Even as psychology was struggling to be recognized as a respectable scientific field, the respected natural sciences themselves were undergoing radical shifts of what it meant to be scientific.

Physics and astronomy had triggered the scientific revolution and established proper science, creating standards of evidence and methodologies (Gribbin, 1998, p. 51; Margolis, 2002, p. 3). The emergence of astronomy is an excellent example of the development and establishment of a scientific field, and so will be briefly discussed to provide context for understanding the development of psychology. Some form of physics and astronomy had existed before the scientific revolution, in the sense that the phenomena existed and had been studied, although not scientifically in the way meant since the revolution*. The first explanation for the movement of the heavens to be widely accepted in recorded history was Ptolemy's concept of stellar spheres. Stars were seen to be embedded in a big sphere which rotated around the earth; the planets were contained on separate spheres. Ptolemy's theory adequately explained astronomical observations for nearly fifteen hundred years, suffering some minor adjustments, but existing overall as a well-defined and well-established system. Ptolemaic thought was more than just an explanation for the way the dots of light in the sky moved around; it was part of a coherent, complex understanding of the world – a paradigm.

The word 'paradigm' is unfortunate in being both critical to certain understandings of science and poorly defined. Thomas Kuhn (1962/1996) adopted the word to describe how he understood change in science. To briefly summarize his approach, a paradigm describes how scientists see the world. It is a coherent and well-developed view of the world, determining what exists in the world – atoms? DNA?

* At least in part because science as it is currently known did not exist before the revolution.

Celestial spheres? – and how it fits together. A paradigm provides a scientist with what kinds of questions he can expect to find an answer to, and guidelines for what kinds of answers are acceptable. For the sciences, "the formation of specialized journals, the foundation of specialists' societies, and the claim for a special place in the curriculum have usually been associated with a group's first reception of a single paradigm" (Kuhn, 1962/1996, p. 19).

Thomas Kuhn's approach, despite some criticism, has become very popular in explaining how scientific fields change over time. Kuhn noticed that a scientific field does not advance gradually, each new generation of scientists adding a few more pieces to the puzzle, so that the field becomes more and more complete. Rather, scientific fields seem to abruptly shift into new directions, replacing well-developed paradigms with a radically different (but often nearly as complete) understanding of the world. After a paradigm shift, "scientists see new and different things when looking with familiar instruments in places they have looked before" (p. 111). The Copernican Revolution is a prime example.

The Ptolemaic explanation for the movements of the stars and planets meshed with the Christian understanding of the nature of the world. Astronomy was part of an ethical and spiritual structure, with the earth – and humans – at the center of the world and Heaven existing just beyond the last heavenly sphere. This encompassing understanding of the world was widespread among both the educated and lay peoples. It was a paradigm which gave order and sense to the world in which people lived. When Copernicus and Galileo proposed an alternate explanation for

astronomical observations, they were challenging the entire worldview – a challenge which was generally and strongly rebuffed.

With time, the quality of observational data improved, including observations which could not be explained by the Ptolemaic system and which could not be incorporated with minor adjustments. What happened next was the Copernican Revolution, one of the earliest and best examples of a paradigm shift. Copernicus' modification could not be part a Ptolemaic world. Moving the Earth from the center of creation destroyed much of the astronomical, ethical, and religious connections of the Ptolemaic paradigm. This would lead to a completely different paradigm, a brand-new way of understanding the universe. It was not quickly accepted, despite the temptation of an explanation both more elegant and more in tune with current observations.

Yet the Copernican Revolution could not have happened without the foundation laid by the Ptolemaic system. The earlier paradigm imposed enough order on the heavens that the discrepancies Copernicus saw could be identified as anomalies, as observations which did not fit. The unexpected cannot be noticed unless there was first a prediction. Copernicus' new theory depended on the centuries of astronomical observations available to him. These centuries of observations contributed to the crisis: the more detail was known about the planets, the less they fit the predictions of Ptolemy's paradigm.

"The proponents of competing paradigms practice their trades in different worlds" (Kuhn, 1962/1996, p. 150). Communication across paradigms ranges from difficult to impossible. The basic assumptions for what the world is like and what can be found in it differ. In the words of Max Planck, "a scientific truth does not triumph

by convincing its opponents and making them see the light, but rather because the opponents eventually die, and a new generation grows up that is familiar with it" (qtd. in Kuhn, 1962/1996, p. 151).

Most of the scientific basis for this particular paradigm shift came from the studies of Copernicus, Galileo, Tycho Brahe, and Johannes Kepler. Their studies would set the basis for scientific astronomy, and the science they practiced would evolve to greater structure and higher standards. The scientific method, as it is defined today, did not suddenly appear when Copernicus published *On the Revolutions of the Celestial Spheres*. Much early scientific work consisted of making accurate observations, combined with mathematics and logical thought. Theories could be tested by comparing predictions with observed results; the congruence between theory-derived predictions and what can actually be observed in the real world remains the standard against which scientific results are judged.

Scientific astronomy dates from 1543, when Copernicus' *On the Revolution of the Celestial Spheres* was published; an impressive history of over four hundred years (Gribbin, 1998, p. 100). Physics came into its own with Newton's universal, mathematically-based laws in the mid seventeenth century, over three hundred years ago. Chemistry is just as old, able to trace its existence as a science back to 1661, when Robert Boyle proposed the existence of molecules; chemists began experimenting with the nature of gases and discovering elements. Serious biological observations began in the seventeenth century as well, when Harvey accurately described the circulatory system. Further observation and experiment uncovered cells,

genetics, and, in 1859, the foundation of modern biology: Charles Darwin's theory of evolution from common ancestors by the process of natural selection.

All of these fields had well-established scientific paradigms by the nineteenth century. (Of course, some of those well-established paradigms were later overturned by continued research). The paradigm provided an overall understanding of how the world was put together and how it could be expected to behave. Within this overall framework, scientists could focus on very small and exact questions, which allowed for very thorough and precise results. This precision meant that even small deviations from what was predicted could be observed, occasionally leading to new discoveries. Astronomers were able to predict the location of a previously unknown planet, chemists expected matter to be made up of elements and were able to predict the existence of elements with specific properties, physicists expected Newton's laws to apply, biologists started discovering the cell (although it took another century to uncover DNA).

Psychology emerges in Europe

The late nineteenth century was when psychology first became an established field (Benjamin, 2007, p. 38). Given the youth of the field, perhaps it is not surprising that many psychologists would become highly motivated to achieve scientific validity (as well as the respect and authority which would come with such a label), and to do so quickly.

As with all the sciences, the subject of psychology – human behavior and thoughts – had been examined, questioned, studied, and speculated about long before the creation of a scientific psychology.

During the nineteenth century, pre-scientific theories including phrenology and physiognomy coexisted with more scientific studies of sensation and perception. Phrenology and physiognomy both used external features – skull shape or facial features – to make judgments about an individual's abilities and character. A few phrenologists did record measurements and attempt to support their claims. Their quantitative data added scientific legitimacy to their conclusions and opened up the possibility for reproducible results. Numbers were associated with science: they indicated some level of objectivity. Unfortunately, while the use of numbers is often necessary for a valid science, it is not sufficient*, and poor science can often result from not recognizing this.

The first serious scientific studies in the field which was to become psychology concerned sensation and perception. Scientists studied the areas of the brain, the way the nervous system worked, and the ability of the sensory organs: the physical components and systems necessary for human thought. William Wundt, "typically regarded as the founder of scientific psychology" trained in medical school, and his first book was on muscular movements and sensations (Benjamin, 2007, p. 38).

The beginning of scientific psychology is usually given as 1879, the year Wundt opened up his psychological laboratory. Wundt published his first book on

* As will be discussed in Chapter Five: Psychological Science during the First World War.

psychology in 1874, but the concept of an experimental laboratory is so central to the concept of scientific psychology that the first one was chosen as the beginning of psychology (Benjamin, 2007, p. 38). Such a choice implies that scientific psychology did not exist prior to the creation of laboratories. Such a choice also reflects the efforts of the early psychologies to deliberately create a science, and

> the importance of experimental technique in defining psychology as a scientific discipline. Psychologists may disagree about the esoteric details of laboratory practice or the proper role of nonexperimental methods, but there seems to be a widespread consensus that laboratory experimentation lies at the heart of scientific psychology. (Capshew, 1992, p. 138)

As early as 1893, writers such as Herbert Nichols, an instructor at Harvard, were claiming that psychology was "an established natural science" and that its "laboratories [were] comparable to those found in more traditional disciplines" (qtd. in Capshew, 1992, p. 134). These are common claims in psychology: the field is and has been constantly striving to be recognized as a valid scientific field, on equal standing with physics, chemistry, and biology. For all their claims, many psychologists are rather obscure in presenting their criteria for making such statements.

In addition to founding the first psychological laboratory, William Wundt trained over 180 students, wrote approximately 50,000 pages, and established the first experimental psychology journal (Benjamin, 2007, p. 38). The result of this was the creation of a specifically Wundtian psychology, a sketch of an entire field of science. He defined psychology as the study of consciousness and noted several distinctions between the way psychology would approach its subject matter and the way the more traditional sciences approached theirs. Whereas a physicist measures the qualities of a

sound using some sort of device, the psychologist is concerned with the immediate, subjective experience of those qualities. Wundt "considered *experimental* not to be restricted to the natural sciences but an important part of an exact mental or social science that combined objective methods with self-observation" (Mandler, 2007, p. 54).

Wundt's experimental methods were introspection and 'experimental self-observation.' Trained observers were presented with some stimulus and then described their experience. Each encounter, and subsequent report, of the stimulus was considered a single experimental trial; often, the stimulus would be modified during a number of such trials, allowing Wundt to study how the changes in the stimulus affected the observers' responses (Benjamin, 2007, p. 42). Wundt also measured the response time between seeing a stimulus and reacting, although this method was later determined to be invalid and abandoned. This method required subtracting the sensory reaction (the time it took to, say, push a button when a light came on) from the total reaction time (the total time between deciding which button to push and pushing it) to determine the mental processing time. Wundt discovered that "changes in the experimental conditions changed the nature of the tasks qualitatively as well as quantitatively," rendering the subtraction protocol invalid (Benjamin, 2007, p. 43). Even though the reaction time studies produced good, objective numerical results, Wundt understood that the procedure which produced those numbers had to be equally objective in order for the results to be valid.

This early psychology was largely sensory psychology, focused on measuring subjective experiences of sensory stimuli. It was possible for these sensory

studies to be "strictly scientific" and obey "rigid rules of experimentation" (Mandler, 2007, p. 56). More complex mental behaviors, in Wundt's words, "are of too variable a character to be the subjects of objective observation," and so received little attention in Wundt's laboratory (qtd. in Mandler, 2007, p. 61).

William Wundt was not the only psychologist experimenting in Germany. Other psychological laboratories quickly sprung up, although each lab had its own focus and did not necessarily agree with any of the other laboratories about what phenomena should be studied and how. While Wundt did address consciousness, attention, and emotion, other psychologists focused more exclusively on memory and other higher-level thought processes. Some of these other first psychologists had developed their theories independently of Wundt, and their psychologies "differed from Wundt's, often in radical ways" (Benjamin, 2007, p. 45). This wide diversity in psychologies was a sign that, no matter how much psychologists boasted of the scientific strength of their field, psychology was far behind the more unified, traditional fields.

Psychology emerges in America

Psychology was also emerging in America, where G. Stanley Hall, motivated by Wundt's writings, opened the first laboratory in 1883. William James had been teaching the only American scientific psychology course since 1875. While William Wundt is usually referred to as the founder of scientific psychology, it should become obvious that there were a number of individuals all beginning to explore the concepts of sensory perception, consciousness, memory, and the other workings of the

mind in a scientific way (Benjamin, 2007, p. 38). Psychology was a new field, and each individual researcher generally decided for themselves which topics to study and how to study them. There was little, if any, overall agreement on which problems to focus on and what methods should be used. There were more gaps in knowledge than knowledge, which resulted in tremendous freedom of approach for the first experimental psychologists.

These first experimental psychologists took advantage of that freedom to completely disagree with each other. While Wundt's psychology was rooted in sensations – simple mental acts which combined to form higher level processes – James' was based in a consciousness which could not be broken down into smaller pieces. James, in fact, cited scientific validity as the reason why his psychology differed from Wundt's, whose theories "start with sensations, as the simplest mental facts, and proceed synthetically, constructing each higher stage from those below. But this is abandoning the empirical method of investigation. No one ever had a simple sensation by itself" (James, 1890, p. 224).

There was not so much one psychology so much as a dozen individual psychologies, each the brainchild of a particular researcher. Each individual theory offered its own explanation for how mental processes worked, and the research guided by each theory differed in terms of topics and approaches. What was important to one early psychologist was not necessarily important to another.

Wundt and James created a new science, grounding psychology in self-observation and experiment, but "neither had a solid base on which to build a

psychology. They were innovators and therefore sometimes vague, repetitious, inconsistent, and unsystematic" (Mandler, 2007, p. 76)

Psychology, as a diverse discipline without common foundations, was seeking to establish itself as a science. American psychologist G. Stanley Hall understood that

> a new scientific discipline needed more than laboratories for research. It needed journals where the new research could be published .... And it needed a professional organization where psychologists could come together to discuss their research and plan for the future of their discipline. (Benjamin, 2007, p. 63)

Scientific research was vital to the existence of a scientific psychology, but research in itself was insufficient. So Hall founded a research journal, the *American Journal of Psychology*, and the American Psychological Association. Hall was deliberately trying to "legitimize psychology as a science" (Buckley, 1989, p. 18). His journal was the first psychological journal in America; others soon followed, representing a diversity of approaches. The *Journal of Animal Behavior* was founded in 1911 by Robert Yerkes (Johnson, 2000, p. 1146). John Watson founded the *Journal of Experimental Psychology* in 1916, which was later added to the collection of journals acquired by the American Psychological Association.

Within academia, psychology faced challenges from two fronts: first, moral philosophers who perceived psychology as a threat to the already compromised religious perspective (Buckley, 1989, p. 19). Second, "those in the natural sciences, whose status had been achieved only after developing a rigorous methodology that provided concrete results, were highly skeptical of psychology's pretensions" (p. 19).

Hall soothed the former by explicitly describing psychology as bringing "a new method and a new standpoint to philosophy [which is] Christian to its root and centre" (qtd. in Buckley, 1989, p. 22). Gaining scientific respectability was the end goal of Hall's professional psychological organization and its journal.

Hall may not have realized it at the time – especially since the terminology did not yet exist – but what scientific journals and professional organizations could create, as psychologists talked and argued and became more coherent in their exploration of their field, was a paradigm.

A paradigm guides 'normal science,' which is the phrase Thomas Kuhn uses to describe regular, typical science. "Normal science ... is predicted on the assumption that the scientific community knows what the world is like" (Kuhn, 1962/1996, p. 5). A scientist cannot conduct an experiment unless he knows what kinds of questions he can expect to find an answer to, and guidelines for what kinds of answers are acceptable. He must be able to sharply focus his attention on a few small puzzles, and design the kinds of instruments and experiments which will allow him to unravel the unsolved puzzles. A paradigm is the scientist's guide to the world, the model of reality he uses to direct his research.

Each individual scientist possesses a paradigm, but a paradigm is most useful when it is widely accepted and determines the course of all normal research carried out in the field. "Men whose research is based on shared paradigms are committed to the same rules and standards for scientific practice" (Kuhn, 1962/1996, p. 11). For much of normal science, "the existence of the paradigm sets the problem to be solved; often the paradigm theory is implicated directly in the design of the apparatus

able to solve the problem" (p. 27). Normal science is, after all, paradigm-directed research aimed at articulating vague aspects of the paradigm or demonstrating the fit between the model and reality.

The diversity of early psychology could not be unified without communication. Not all this communication was within the field; psychological results needed to be known to other scientists and to the public as a whole. James McKeen Cattell, who had established a laboratory in 1889 and coined the term 'mental tests,' became the editor of *Science* magazine in 1894. The result, perhaps unsurprisingly, of having a psychologist editing the magazine was the publication of psychological research: "Cattell gave psychology scientific visibility at a time when it was struggling to establish itself in the community of sciences" (Benjamin, 2007, p. 71).

Still, by 1900 psychology was not yet established as a science on equal standing with the natural sciences.

> There was nothing that one could point to as *the* science of psychology. There was still no clear distinction within many academic institutions between philosophy and psychology; indeed, many members of the American Psychological Association considered themselves to be philosophers. Psychologists disagreed among themselves what constituted a science. (Buckley, 1989, p. 31)

Structuralism and Functionalism

Two of the larger focuses in psychology at this time were structuralism and the functionalism, both concentrating solely on the study of consciousness. E. B. Titchener sought a scientific way to study consciousness' structure. To study

consciousness was to observe it. Introspection by trained observers* formed the entirety of Titchener's experimental method. He recognized the possibility for error and bias in self-observation, but nevertheless insisted on its accuracy and scientific value. With training and concentration, it was possible "to secure reliable results;" "we must be strictly impartial and unprejudiced, facing the facts as they come, ready to accept them as they are, not trying to fit them into any preconceived theory" (Titchener, qtd. in Benjamin, 2007, p. 79-80). Unfortunately, when another laboratory attempted the same experiments and reported different conclusions, Titchener blamed the discrepancy on improper training on the part of the disagreeing laboratory.

The disagreeing laboratory was that of Karl Marbe and Oswald Külpe at the University of Würzburg, whose research uncovered instances of a phenomenon they named imageless thought. The subject was aware of "a kind of conscious experience that was neither an image nor an awareness of an act of will or choice" (Mandler, 2007, p. 78). Once this phenomenon was named, the trained subject-observers began reporting it with increasing frequency. Titchener denied its existence. Did Marbe and his subjects experience a mental phenomenon that Titchener did not? Or did Titchener's denial of the existence of imageless thought prevent him from observing it? The historian George Mandler notes that Titchener's and Marbe's results were remarkably similar, despite disagreement over what they were observing. Self-observation is incredibly sensitive (and vulnerable) to the language used to report it.

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* The history books do not go into much detail about how this training occurred, beyond noting that Titchener's observers used a language he specified to report on the most basic terms of their experiences.

Both parties agreed that "the essence of the psychological experiment was controlled *introspection*. ...If our experimental technique is introspection and if this is all the material we have to work with, then psychology must remain the analysis of the conscious mind" and fail to account for any unconscious processes (Mandler, 2007, p. 89).

The study of the function of consciousness was popular in America, even though the structuralist Titchener rejected it as inferior. Functionalists utilized self-observation and questionnaires, measured personality and used animal subjects. They also performed straightforward scientific experiments involving independent and dependent variables. James Rowland Angell was a famous functionalist whose students included John Watson.

Psychology was branching out; there was much in this new field to study, and many different ways to approach it. Clinical psychologists emerged, concerned with how to apply this new scientific knowledge in any number of areas – therapy, advertising, business, law, and intelligence testing.

There was also Sigmund Freud, famous and highly unscientific. The public was fascinated by psychoanalysis, but in terms of scientific validity Freud's theories were little better than the claims of the phrenologists. The popularity of Freudian thought coincided with a trend in American psychology to shift away from introspection and the entire study of consciousness. The unconscious, as far as these psychologists were concerned, was even worse, since it could not be observed at all.

The other end of the spectrum – the study of explicitly observable behavior – was about to be explored.

Behaviorism

Behaviorism was a trend in American psychology from about 1913 to the 1950s. John B. Watson is acknowledged as its founder, and behaviorism appealed strongly enough to Edward Tolman, Clark Hull, and B. F. Skinner that they based their research on its ideas. Up until this point, psychology had largely focused on consciousness and other mental states, and relied almost entirely on introspection and self-report as its experimental methods. Watson was dissatisfied with both the focus and the methods then in use, so he pioneered his own psychology.

The origin of behaviorism is usually dated to a lecture John Watson gave at Columbia University in February of 1913 and published later that year in the *Psychological Review.* He began both lecture and article with a new definition of psychology:

> Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. (Watson, 1913b, p. 158)

Note from the very first sentence what Watson is attempting to achieve: *a purely objective experimental branch of natural science*. The goal of behavioral psychology is to finally achieve the status and recognition of a 'natural science.' Introspection and the study of mental states failed to achieve this status over the first fifty years of psychology's scientific existence, so Watson proposes an alternative. Psychology should focus solely on behavior, a more objective, directly observable phenomenon than subjective mental states. Doing so would abandon any need to rely on

introspection, which Watson dismissed as an unscientific method. Redefining psychology to include only directly observable phenomenon excluded a number of topics (such as consciousness) and restricted the study of others (such as emotions).

It would take until the 1920s for Watson's ideas to influence major American psychologists, "but behaviorism would come to dominate American psychology like no school before or since .... Watson's call to arms for a science that would be capable of prediction and control" appealed to a number of psychologists (Benjamin, 2007, p. 144). These psychologists each approached the idea of a behavior-based psychology from a slightly different angle, studying different aspects of behavior and in different ways. Edward Tolman included cognition in his approach, justifying this decision by only studying cognitive processes in terms of observable behaviors. Clark Hall was dedicated to the development of a theory of behavior (and thus of psychology) which could be expressed in terms of laws: he "came to the definite conclusion around 1930 that psychology is a true natural science; that its primary laws are expressible quantitatively by means of a moderate number of ordinary equations" (Clark, qtd. in Benjamin, 2007, p. 147). B. F. Skinner completely rejected any hint of cognitive influence and performed extensive studies on the control and modification of behavior. Skinner saw the abandonment of cognition as vital for psychology's standing as a science.

This movement is sometimes called the Behaviorist revolution, a term which is not quite accurate. Watson was proposing a new paradigm, one which differed drastically from the paradigms then dominating psychology. Not all psychologists flocked to the behavioral paradigm, and the movement was largely

replaced by its opposite – a shift back to cognition – after five decades. But those two facts are irrelevant in determining whether or not this was a revolution, in the Kuhnian sense of scientific revolutions embodying paradigm shifts. The key factor is the presence of multiple paradigms of psychology at the time of (and continuing after) Watson's proclamation. Psychology was still in a pre-paradigm state. The field lacked a dominant, over-arching, universally (or nearly so) accepted theory of human thought or behavior. Individual psychologists formed their own theories of psychology: unique explanations of how mind (or behavior) functioned, unique methodologies, unique decisions on what phenomenon were important to study and which were unimportant. This is why a discussion of early psychological history is a discussion of various individuals and their unique (or partially shared) perspectives.

In any case, what is of primary interest here is Watson's specific motivation for behaviorism to be recognized as *a purely objective experimental branch of natural science*. What were the properties of behaviorism which identified the approach as scientific? What were the important aspects of a scientific field, and how were they expressed in Watson's experiments, articles, and lectures?

Chapter 3

PSYCHOLOGY ACCORDING TO WILLIAM JAMES

William James was the first psychologist in America, working at the same time as William Wundt. He was self-taught, approaching psychology from physiology and the background provided by a Harvard medical degree. In 1890 his two-volume *Principles of Psychology* was published, intended to be an overview of all existing psychological work. He discussed "consciousness, sensation, perception, association, memory, attention, imagination, reasoning, emotions and will" and drew from "decades of work in neurophysiology, sensory physiology, and psychophysics, and the psychological work of the previous decade" (Benjamin, 2007, p. 59). He emphasized the study of consciousness. At the time, consciousness was a more scientific topic than the soul or mind, which was the focus of the pre-scientific ancestor of psychology, mental philosophy.

A discussion of James' writings will provide a solid context for a similar analysis of Watson's ideas. William James had been directly influenced by Ernst Mach, who had done much to establish a concern for facts, prediction, and observation as the basis for scientific thought. Mach had studied psychology as well as physics. Both Mach and James read each other's work (James made frequent comments in his copies of Mach's writings) and corresponded frequently and in depth (Holton, 1993, p. 10).

The subject matter of psychology

James begins *The Principles of Psychology* (1890) with the statement "Psychology is the Science of Mental Life, both of its phenomena and their conditions. The phenomena are such things as we call feelings, desires, cognitions, reasonings, decisions, and the like" (p. 1). The various abilities of the mind, the faculties of Memory, Reasoning, Volition, Imagination, Appetite, etc. can be viewed as manifestations of the Soul (p. 1). An alternative view, a "psychology without a soul" can be formed by viewing mental life as the result of ideas.

Both Watson and James define psychology as a science from the first sentence. But it becomes immediately obvious that vast differences exist between their respective definitions of science. James apparently sees no contradiction in using the words *Science* and *Soul* in describing psychology. He does present the alternative view of psychology, but this is without completely dismissing the soul as a possible part of mental life.

James is presenting the view of the scope of psychology that dominated the field until Watson. Psychology is the study of mental life: it is the study of Mind and of consciousness. The faculties of consciousness, including memory and reasoning, are best observed through introspection. A consideration of these faculties yields questions: for example, why can recent events be remembered better than past events, yet childhood memories are still clear in old age? However the faculty exists, it "works under conditions" and the "quest of the conditions becomes the psychologist's most interesting task" (p. 3). The brain is clearly important, and the nerves, as "no mental

modification ever occurs which is not accompanied or followed by a bodily change" (p. 5).

At the moment James was writing, psychology was addressing a broad and loosely defined set of topics. James believed that instinct and animals should be studied if doing so would "throw any light on the main business at hand" (p. 6). Nerves and other bodily functions are part of the scope of psychology, but not the primary focus. His opening chapter discusses, with equal importance, the behavior of humans and of frogs. John Watson would have approved: one of his objections to his contemporary psychology was its denial of the value of animal work. However, when James discusses the actions of the frog, he assumes that the frog is working to achieve a goal, an assumption of which Watson would have greatly disapproved. Watson considered such assumptions ridiculous; on what grounds can the human researcher make guesses about the mental processes of the frog?

James is not perturbed that psychology is dealing with such broad and ill-defined subject matter. "At a certain stage in the development of every science a degree of vagueness is what best consists with fertility" (p. 6). This implies that a field does not instantly become a science, but goes through a period of unclear goals, when all sorts of topics are studied. At this time, vagueness in the goals and direction of the field will lead to a profusion of ideas open to study and exploration; many kinds of ideas and theories will emerge from this undirected exploration.

Despite the benefits James saw in vague, fertile periods, he desired psychology to move towards more specific goals and formulas (to use James' term).

Even a vague formula is still a narrowing down of the subject; for example, the formula that

> the essence of mental life and of bodily life are one, namely, 'the adjustment of inner to outer relations.' Such a formula is vagueness incarnate, but because it [views the mind and environment as affecting each other] it is immensely more fertile (p. 6)

than the prior psychology which viewed the soul as detached and separate. Each step towards a clear and specific goal will yield new questions.

These clear and specific goals will all relate to Mind, which is the focus of psychology. Mind expresses itself in end-directed, teleological behavior. Mind is what allows an animal to find an alternative path when the direct one fails. Romeo will go to great and creative lengths to reach Juliet, and a frog will dive to discover the edge of the barrier trapping him below the surface. In sum, "no actions but such as are done for an end, and show a choice of means, can be indubitable expressions of Mind" (p. 11). Again, James is including animal behavior as within the scope of psychology, but is doing so by interpreting behavior to understand Mind.

The methods of psychology

The Principles of Psychology (1890) covers the functions of the brain and other physiological foundations before discussing "The Methods and Snares of Psychology."

"Psychology is a natural science: That is, the mind which the psychologist studies is the mind of distinct individuals inhabiting definite portions of a real space and of a real time" (p. 183). That is, psychology is a science because it studies specific,

existing minds rather than the abstract concept of Mind or Intelligence the way a philosopher does.

There is a quality of objectivity to this approach of studying mind. "To the psychologist, then, the minds he studies are *objects*, in a world of other objects. Even when he introspectively analyzes his own mind, and tells what he finds there, he talks about it in an objective way" (p. 183). Since a psychologist is able to objectively describe his own perceptions, he is of course capable of objectively dealing with the perceptions of others.

This is one of the basic differences between James and Watson, or between the introspectionists and the behaviorists. James believes that introspection is objective. He values objectivity; to be objective is part of being scientific. Watson holds this same value, but does not believe that introspection is capable of being objective. Each holds the same goal but disagrees on which methodologies qualify as being objective – and therefore scientific.

Like Watson, James mentions that the objectivity of the psychologist, at least in terms of some basic assumptions, is the same as that of "the geometer, the chemist, or the botanist [who] make precisely the same assumptions as he" (p. 184).

"The methods of investigation" for James is really one method: "Introspective observation is what we have to rely on first and foremost and always" (p. 185). This process of "looking into our own minds and reporting what we there discover" allows the psychologist to study thought. Since "every one agrees that we there discover states of consciousness;" since even the most skeptical individual must admit he has thoughts, James regards "this belief as the most fundamental of all the

postulates of Psychology." The behaviorists would, of course, beg to differ*. Regardless, James is being very clear about the founding assumptions of his psychology.

He is equally clear about some of the challenges faced by this introspection-based research, starting with the difficulty surrounding terminology. Twenty-five years later, Watson would also complain about the lack of precise meanings in psychology.

Next James acknowledges that "the inaccuracy of introspective observation has been made a subject of debate" (p. 187). One problem is that from a spiritual, soul-based psychology, the "subject of mental life is a metaphysical entity, inaccessible to direct knowledge," and so unobservable by introspection. Despite James' claims that psychology is a science rather than a philosophy, statements like the one just quoted show how close the two fields were at this time. Remember that psychology had existed as a separate entity for about eleven years when James' books were published.

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* It seems as if psychology had, compared to the traditional natural sciences, a more rocky start. While astronomers argued over theories (and paradigms, especially regarding Copernicus), there is less of a sense of disagreement over the very founding assumptions of what the field should be studying. In psychology, there were disagreements not only over theories to explain certain phenomena, but even over what phenomena should be studied and what methodology should be used. This might be because psychology is addressing a topic both elusive in definition and capable of being studied many different ways. We do not have comparable records of the earliest days of astronomy, the time when the field was defining its primary topic, but it is conceivable that questions of *how* to study were much less of a dispute in early astronomy.

The field would change quickly, becoming much closer to the physical science model by the time Watson would propose behaviorism as the scientific psychology.

James presents both extreme viewpoints on the use of introspection as a methodology for gathering data. Introspection can be viewed as completely infallible: objects do not exist outside of how they are perceived. Incidentally, this raises psychology above the other sciences: "Who, then, can deny that in this a great superiority of Psychology over the physical sciences comes to light?" (Brentano, qtd. in James, 1890, p. 187). The other extreme is the position that introspection is completely ineffectual; that it is impossible for humans to observe the workings of their own minds. " '*Internal observation*' gives almost as many divergent results as there are individuals who think they practice it" (Comte, qtd. in James, 1890, p. 188). James dismisses this argument by claiming that psychologists have now mastered an empirical psychology (dependent, of course, on introspection). Humans are clearly aware of thinking, of what they observe and reason.

Note in these arguments that the subject matter of psychology is being laid out. It is consciousness, and only consciousness. The method defines the subject matter: the two combine, and the result is the beginnings of a paradigm. "The existence of the paradigm sets the problem to be solved; often the paradigm theory is implicated directly in the design of apparatus able to solve the problem" (Kuhn, 1962/1996, p. 27). What psychology studies is closely tied to how it is studied, but the relationship is not just one way. The methods used focus attention on some phenomenon while completely ignoring others. If psychology is the study of consciousness, and if introspection is the preferred method for observing

consciousness, then whatever is observed through introspection must be the subject matter of psychology. A psychology which uses introspection to study consciousness is a different psychology than one that uses controlled, quantitative experiments to study behavior.

There is still the problem of what exactly the psychologist is observing: it is the immediate perception, reasoning, or feeling, or is the psychologist relying on his *memory* of the perception, reasoning, or feeling? Human memory in general is somewhat fallible, so how can a psychologist be certain of a memory of a certain mental state? To name a mental state is to distance oneself from it. There are considerable grounds for doubting the veracity of introspection. But James defines psychology as the study of consciousness, and he defines consciousness as that which is observed through introspection, so despite his doubts he continues to rely on introspection as the methodology a psychologist uses. He does this even when announcing, on page 191 of a 689 page tome, that "the rest of this volume will be little more than a collection of illustrations of the difficulty of discovering by direct introspection exactly what our feelings and their relations are." In conclusion, "introspection is difficult and fallible; and that the difficulty is simply that of all observation of whatever kind." In other words, introspection has flaws, but since *all* methods of observation have flaws, this is not sufficient grounds to abandon introspection as the primary tool of the psychologist.

The solution to doubts about the accuracy of introspection is science. More specifically, it is the fact that a science is practiced by groups: if one individual's introspected observation is at fault, it can be corrected when compared with the

observations of other psychologists and with latter observations by the same individual. Science is not only objective; its results must also be reproducible. This is a valid, scientific approach to the problem; however, in practice it did not work as well as James hoped. The most notable example is the previously discussed debate of imageless thought. Introspection proved to be too subjective for differences to be settled by widespread testing.

Introspection is also experimental. There should be no doubt that James and Watson would disagree as to what factors are necessary for an experiment; introspective experiments do not approach the precise degree of measurement obtained by behavioral studies. The former rely exclusively on "introspective data, but eliminating their uncertainty by operating on a large scale and taking statistical means" (p. 192). Large subject pools and statistical analysis are still recognized as important components of a scientific study, but they are not sufficient in themselves.

James discusses one other source of data for the psychologist: it is possible to learn something about mental processes by studying "the instincts of animals" and the "reasoning faculties of bees and ants, the minds of savages, infants, madmen, idiots" (p. 194). James does not go into much detail as to what methods should be used in comparative studies, but he indicates that a psychologist would attempt to interpret (or guess) at the mental processes of the animal or savage. This is precisely the kind of animal work that Watson would rally against so strongly, arguing that this method was subjective and unscientific. Watson was not only objecting to the methodology but also to the subject matter which required that methodology. Since his psychology was grounded in observable behavior, it would require different ways of gathering data.

Truth in science

James concludes his methods chapter by reiterating that "thoughts are the subjective data of which [a psychologist] treats, and their relations to their objects, to the brain, and to the rest of the world constitute the subject-matter of psychological science. Its methods are introspection, experimentation, and comparison" (p. 197). What is interesting about James' conclusion occurs in the following sentence, when he states that "introspection is no sure guide to truths about our mental states." James has already described enough weaknesses and flaws in the introspective method that it is almost surprising that psychologists continued to use it. But to change the methodology would require a change in the subject-matter of psychology, and it is difficult for a field to make such a change. The reliance on introspection, despite is flaws, is understandable. But note what he is using this method to search for: *truths* about mental states.

Truth is something which most current scientific fields avoid discussing. Rather than attempting to tackle the question 'what is truth?,' the sciences instead search for facts and theories – with the constant understanding that the accepted theory, no matter its validity or fruitfulness in guiding experiments, has in no way been proved to be 'true.'

A scientific theory may provide a reasonable picture of the world and allow for the accurate prediction of phenomena, but that does not mean that the world actually exists in accordance with the theory. The success of scientific theories "is not that they follow from the real world, but that they predict a world which is essentially like ours" (Bronowski, 1978a, p. 36). Newton's theory of gravitation predicted the

existence of Neptune before the planet was discovered; for nearly three centuries gravitation was the "one causal law which is certain beyond all challenge" (p. 64).

> And yet, and yet, the laws of gravitation have gone. There is no gravitation; there is no force at all; the whole model was wrong. All that theory was no more than a happy approximation to what really happens…. The machine was never a copy of nature. It was only a kind of gigantic planetarium which got the heavenly bodies to right place at the right time, but whose causal mechanism was no more like nature that Ptolemy's itself. (pp. 65-66)

In science, hypotheses can only be disproven, never proved. Newton's law of gravitation held up to all the tests that could be thrown at it until Einstein looked at the theory and started asking different questions. "The insight is not in answering the question: it was in asking it" (p. 103). The history of any particular science is not a gradual progress towards a more thorough and accurate model of the world; it is the replacement of one thorough model for another one. "A new theory, however special its range of application, is seldom or never just an increment to what is already known. Its assimilation requires the reconstruction of prior theory and the re-evaluation of prior fact" (Kuhn, 1962/1996, p. 7).

Science appears to create models which are increasingly more attuned to the observed world. These models are often vastly different, and the increased 'accuracy' is achieved not by improving the existing model, but by discarding it and accepting a new model which works in completely different ways. Despite the tendency to search for truth in scientific theories, there is no assurance that there is any

similarity between the theory and whatever mechanism or laws actually govern the world.

Psychology as a science

Two years after James' two-volume set *Principles of Psychology* was published, he produced a more concise single volume. The Introductory of this volume provides further insight into James' science of psychology. It is worth quoting him directly for several sentences.

> Psychology is to be treated as a natural science in this book .... Most thinkers have a faith that at bottom there is but one Science of things, and that until all is known, no one thing can be completely known. Such a science, if realized, would be Philosophy. Meanwhile it is far from being realized; and instead of it, we have a lot of beginnings of knowledge made in different places, and kept separate from each other ... until with later growth they may run into one body of Truth. (1892/1983, p. 3)

As in his larger work, James is concerned with Truth in a philosophical sense. But he quickly moves past a discussion of Truth and into the specifics of the sciences. The "beginnings of knowledge are the Sciences." The separations between the various sciences are imposed for the purposes of practicality; there is no qualitative difference between the sciences. Each science "accepts certain data unquestioningly;" for example, physics assumes that the world is made of matter and that matter exists outside of a perceiving mind. Psychology is the same, adopting particular data (thoughts, feelings, and knowledge) and leaving it "to more developed parts of philosophy to test their ulterior significance and truth" (p. 4). This implies a distinction between science and philosophy. Psychology will approach concepts like 'thought' and

'knowledge' scientifically, seeking a greater understanding by describing and explaining, and leaving aside certain questions for philosophy.

Empirical psychology is psychology as a natural science. Rational psychology is closer to philosophy, and "the *full* truth about states of mind" (p. 4) will require both rational and empirical psychology. "Meanwhile an immense amount of provisional truth about [states of mind] can be got together, which will work in with the larger truth ... when the proper time arrives." Thus science and philosophy are interconnected.

After touching on the questions of philosophy, James returns to a more scientific discussion. He argues that the mind cannot be studied out of context; "mind and world in short have evolved together, and in consequence are something of a mutual fit" (p. 5). Note the acceptance of evolutionary biology. He searches for psychological formulas, explains that "*all* states of mind, even mere thoughts and feelings, are *motor* in their consequences" (p. 6).

He proposes that "mental action may be uniformly and absolutely a function of brain-action" (p. 7). As a hypothesis, James admits that this proposal may not be entirely true, or otherwise flawed.

> But the only way to make sure of its unsatisfactoriness is to apply it seriously to every possible cause that can turn up. To work out a hypothesis 'for all it is worth' is the real, and often the only, way to prove its insufficiency. (p. 7)

Which is precisely how science works.

> It will doubtless take several generations of psychologists to test the hypothesis of dependence [of mind-states on brain-states] with anything like minuteness.... But the student will remember that the Sciences

> constantly have to take these risks, and habitually advance by zigzagging from one absolute formula to another which corrects it by going too far the other way. (pp. 7-8)

Reaction to the field of psychology

James was critical of psychology's movement towards the experimental and empirical during the 1890s. When G. Stanley Hall founded the *American Journal of Psychology* in 1886, intending the journal to aid psychology's progress towards scientific respectability by including only empirical studies, James objected to this limitation (Buckley, 1989, p. 22). The results of the psychological laboratories were often "disappointing and trivial" to James (qtd. in Buckley, 1989, p. 26). He spoke of structuralism and other searches for the elements of mental life in equally disapproving terms.

In his criticism, James shared the desire for psychology to achieve recognition as a valid science. He would compare psychology to the natural sciences, and assume psychology could achieve equal levels of control and prediction. He saw psychology's lack of primary laws and fundamental assumptions as being similar to pre-Galileo physics (Buckley, 1989, p. 26). Psychology ought to become scientific; in this James was in agreement with the body of American psychologists. It was the question of *how* to become scientific over which there was debate.

Science as defined by William James

William James saw science as a part of philosophy. All sciences would eventually combine to form one coherent body of knowledge, and the goal of science

was to find Truth. The distinction between a science such as psychology and philosophy is that psychology studies specific objects (individual minds) while philosophy addresses the abstract concept of Mind. Science is therefore objective, and scientists strive for accurate, non-subjective results. Sciences also gather numerous observations. The same individual will make many observations about their own mind, and discuss their conclusions with other scientists who are doing the same thing. A single observation may be in error, but a numerical analysis of a number of observations is unlikely to be inaccurate.

Science works by testing hypotheses. Only by thoroughly testing a hypothesis, in all sorts of conditions, can any statement be made about its validity. If the hypothesis is unsatisfactory, then the science will abandon it and develop a new theory. Usually a science will 'zigzag' between opposite hypotheses over time. Vague, undirected, and fertile early periods will produce many ideas and theories, but the field is always advancing towards greater understanding.

Chapter 4

SCIENCE ACCORDING TO JOHN WATSON

Watson's first encounter with psychology and his initial dissatisfaction with its methods

John Broadus Watson was born in 1878 and grew up in a rural area near Greenville, South Carolina (Buckley, 1989, p. 3). He viewed education as a means to success. His first encounter with psychology was at Furman University, where he enrolled in 1894 and took several psychology classes from Gordon B. Moore (p. 12). In 1900 Watson managed to get himself a scholarship to the University of Chicago (p. 1), first majoring in philosophy but quickly switching to experimental psychology (p. 39). After his fleeting interest in philosophy, Watson discovered comparative (or animal) psychology, and remained focused on this area of study. He studied under Jacques Loeb, who had a strong influence on Watson and helped lay the foundations of what would become behaviorism (pp. 40-41). This was when Watson became convinced that humans were biological mechanisms, organic machines whose behavior could be studied, understood, and then controlled. "According to Loeb, scientific knowledge was a tool to modify and control the behavior" of organisms, and "physio-chemical explanations could account for all life processes" (p. 41).

Watson studied the relationship between behavior and the development of the nervous system in white rats. His dissatisfaction with current psychological experimental methods was already in evidence. Most of the prior research on white

rats had been observational; the animal had only been introduced to American psychological laboratories in 1892 (p. 42).

> Watson's emphasis on a systematic account of learning in animals was an attempt to differentiate the new experimental method in animal psychology from what he considered to be unscientific approaches. He criticized older investigators of animal intelligence for basing their studies on secondhand accounts of clever animal behavior. Watson praised researchers like Lloyd Morgan, who in opposition to the 'anecdotal school,' established the technique of observing the learning process itself. (p. 42)

Watson became an instructor at Chicago in 1903, and in 1904 psychology was established as an independent department at the university (p. 46). Watson continued to express his criticism of what he saw as unscientific research practices and "inadequate experimental treatment" (Watson, 1904, p. 362). While acknowledging the importance of preliminary groundwork,

> we do plead for long and careful studies in more restricted lines than that represented by simply taking an animal and watching its general behavior. It is time to put the animal in such situations that some one mental act may be exhibited to the exclusion of others. (p. 363)

In 1910 Watson wrote an article for the popular magazine *Harper's*[*] describing the new science of animal behavior which would change the nature of psychology (Buckley, 1989, p. 62). Unsurprisingly, Watson stresses the scientific: he

[*] This is a popular article, which implies that it not academically rigorous, but it was published while Watson was still actively engaged with academia. Therefore, while its statements may be more extreme than if published in a psychological journal, it is not as extreme as Watson's post-academia popular articles.

discusses "the new science of experimental psychology" which replaced "its rival, the older, speculative or metaphysical type" (Watson, 1904, p. 346). He describes the early days of animal behavior, whose data consisted of "chance observations" and "anecdotes," as "similar to that of physics when the latter science concerned itself with the question as to whether the sun revolved daily around the earth." This early animal work was "of no value to the science," as it lacked "a single carefully constructed experimental test of the acts in question" (p. 347).

The new science of animal behavior would start with a period of basic observation followed by thorough examinations of the animal's senses: can the animal perceive color? Can the animal distinguish between a circle and a square, or a circle and an ellipse? Watson valued these detailed, objective examinations. Much of Watson's animal research would focus on questions of perception. He provides a description of the experimental method used to examine the color vision of a monkey. The animal is conditioned to associate red light with food, and so if the animal persistently goes to the red light then it can be assumed that the monkey can distinguish between red light and another color, such as green. But of course, Watson points out, differences in brightness or intensity will also have to be examined before the researcher can say with confidence that his animal can distinguish between red and green light. Watson's experimental method is thorough and cautious in approaching its conclusions. His method requires that a researcher have a complete grasp of how his animal perceives the world before he moves on to studying how the animal learns[*].

[*] Ironically, Watson relies on learning – conditioning – to determine the animal's perceptive abilities.

Watson continued to design his experiments around the study of behavior: "his interest lay in how an organism reacted to its environment. This could be determined not by introspection, but by observation of behavior" (Buckley, 1989, p. 54). This was a new direction for psychology; previously the mind, not behavior, was the focus. In 1908 Watson moved to Johns Hopkins University, where he spent five years further honing the methods and theory of behaviorism. At Johns Hopkins, he argued for the creation of a separate department of psychology, explaining that his studies were closer to biology than philosophy. "Watson wanted psychology to be established on equal footing with the rest of the natural sciences, and he believed that its acceptance by the scientific establishment depended upon its ability to produce results" (p. 62). He also understood that stressing the practical benefits of psychology justified the expense and time required for research (p. 69).

The state of psychology prior to Watson's Behaviorist Manifesto

Psychology was entering a minor crisis by the time Watson publically announced behaviorism. The original founders were beginning to fade out of active research and publication, but the next generation could not agree on a single leader or theoretical foundation (Buckley, 1989, p. 66). 1910 saw the creation of the *Journal of Animal Behavior*, a deliberate move by Watson and Robert Yerkes to strengthen behavioral psychology and stress its ties with the biological and physiological disciplines (p. 67). A 1912 report by Christian Ruckmich in the *American Journal of Psychology* statistically demonstrated (via the use of questionnaires and numerical measurements, such as the number of professors or students) the current status of

psychology. This status was purely within the academic setting: progress was judged in terms of number of independent departments, quantity of professors and students, and available funds. Generally, "rapid progress is being made in the way of increasing registration of students, academic work accomplished, and the establishment of prestige in the institution" (p. 522). However, there was still concern over the tendency for psychology and philosophy to be grouped under the same department, with adverse affects for empirical psychology.

> The most frequent complaint is to the effect that wherever students in psychology are also required to elect philosophy they fall into a 'philosophising tendency' which works havoc with the empirical approach attempted by modern psychology. Here seems to lie the main point at issue. In spite of repeated efforts to the contrary, it must be conceded by the philosophers that the method of approach of their discipline and sub-disciplines is not of the same empirical nature as is that of the psychological laboratory. (p. 523)

This complaint is all the more pressing because "the 'scientific approach' of experimental psychology is responsible for the steady progress of the discipline" (p. 523). The paper concludes that "psychology, after over 25 years of growth, does not stand very high on the honor roll among other academic subjects" when compared to physics, philosophy, political economy (a field roughly as young as psychology) and education (p. 530). Various explanations are suggested, including an acknowledgement that psychology's youth is forcing the discipline to establish itself both within and without academic institutions at the same time.

> The hardships of progress are most decidedly emphasised when the discipline in question is attempting to gain credit at once in the world at large and in the university, i.e., when it lacks a long historical development antedating academic recognition. (pp. 530-531)

The introspective method may also be responsible. Ruckmich comments that

> the introspective method, peculiar to the psychologist, may offer a hindrance to the ready acceptance of the discipline because of the false assumption that it requires either an abnormal gift of some sort or years of toilsome training. The very fact that the method is itself variously interpreted, and sometimes poorly understood even by psychologists, suggests that there is difficulty. (p. 531)

Watson's growing dissatisfaction with introspection in specific, and the state of psychology in general

For Watson, "introspection had long been a major reason" for his "dissatisfaction with the mainstream of experimental psychology (Buckley, 1989, p. 70). Watson's insistence on objective standards and a reliance on what could be observed lead him to "define behavior as a biological problem while ignoring consciousness" (p. 71).

> I have thought of writing … just what I think of the work being done in human experimental psychology. It lacks an all embracing scheme in which all of the smaller pieces may find their place. It has no big problems. Every little piece of work which comes out is an unrelated unit. This might all be changed if we would take a simpler, behavior view of life. (Watson, qtd. in Buckley, 1989, p. 72)

Watson saw how there was not one psychology, but rather many, with each one focused on its own problems and studying its own phenomena in its own way. He desired a single, united psychology – a psychology which would be more similar in its structure to physics and the older sciences. Watson complained that consciousness-focused research "takes us away … from the good graces of the physicists" (Watson,

qtd. in Buckley, 1989, p. 71). If psychology could abandon consciousness, which Watson saw as "merely a tool, a fundamental assumption," then psychology could begin to finally achieve reasonable status within the natural sciences (qtd. in Buckley, 1989, pp. 71-72).

As Watson was developing his scientific study of behavior, he was also teaching introspective psychology. "I had to … fight to make introspective psychology scientific, and I have had many rows and arguments with biologists and others trying to make my points….Finally my stomach would stand no more and I took the plunge" in 1912 (Watson, qtd. in Buckley, 1989, p. 80). In 1913 Watson announced behaviorism to the world, as the first of a set of lectures at Columbia University (Mills, 1998, p. 63).

As this lecture is generally referred to as the Behaviorist Manifesto, and as it is behaviorism's first formal introduction to psychology at large, it is worth a very careful examination. Watson's behaviorism was not set; he was an active psychologist, not only performing experiments but also interacting with the larger world of psychology via other scientists and journal articles. His ideas would shift and change over time.

The lecture was also a chance for Watson to repeat his conviction that psychology ought to be respected as a natural science. He has a number of objections to the then dominant model of psychology, some specific and some more obscure. In both cases it is possible to gain an understanding of the qualities Watson felt important to a natural science.

Watson was not the first psychologist to criticize introspection; dissatisfaction with the methodology and the focus on consciousness had been raised in

1904 by James Cattell and in 1910 by James Angell (Buckley, 1989, p. 77). The reaction to Watson's behaviorist manifesto was mixed. "Many applauded his critique of experimental methodology," but few were willing to abandon entirely the study of consciousness (p. 78). Still, "Watson won the support of the majority of American psychologists because he articulated the hopes of many in the profession who struggled for the recognition of psychology as a full-fledged member of the scientific community" (p. 86). Watson's preferred experimental method of studying isolated individuals received its own criticism as it ignored any social determinants of behavior (p. 79).

1913: Behaviorism is formally introduced to psychology

In 1913 Watson presented the manifesto of the behaviorists, calling for his new psychology. This was both a "challenge [to] psychologists' fundamental assumptions" and a "call for radical measures to prepare the way for a science of behavior that would fulfill what he believed to be the true promise of psychology" (Buckley, 1989, p. 74). His goals and aims are made clear from the very beginning.

> Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. (Watson, 1913b, p. 158)

Throughout the lecture (later published), Watson references the established natural sciences – physics, chemistry, biology. In comparison, psychology falls short of being accepted as a natural science. Watson states his firm belief that psychology should be recognized as a natural science, and that if this has not happened after fifty years of

introspection-based consciousness studies, then something is wrong and psychology must try a new approach.

Watson has two main criticisms against contemporary psychology. The first one he addresses is that, currently, all studies in psychology must be valued in terms of their application to 'consciousness.' Behavior, whether animal or human, was only considered important if it somehow could be understood in terms of mental processes. Watson had spent twelve years studying animal behavior, which cannot be studied using introspection or judged in terms of consciousness. He was searching for a theoretical understanding of psychology which would accept animal behavior as a legitimate field of study. Much of his work involved the senses, focusing on (for example) what wavelengths of light a rat could distinguish, and his results were based on the experimental observation. Much of the behavior he studied occurred at the unconscious level. A consciousness-based psychology had no place for either behavior or the unconsciousness.

Watson's second criticism is that psychology has failed to be recognized as a science. It has failed to achieve the standards necessary in a science. This is almost entirely, in Watson's view, because of the reliance on introspection as the only valid means to gather data about consciousness. Introspection is a flawed methodology, failing to rely on objective, observable results and to generate reproducible results which will hold across numerous trials and laboratories. Those who relied on this methodology which resulted in "experiments which could not be controlled" and "insisted on assumptions which could not be verified were hardly scientists and certainly not psychologists" (Buckley, 1989, p. 75). Worst yet, the reliance on these

unscientific methods and the focus on consciousness were responsible for the lack of scientific respect psychology was now enduring (p. 76).

Behaviorism, on the other hand, was based on valid scientific methodologies and therefore had the power to "transform psychology" into "a genuine science" (p. 81). Psychology's standing as a science was largely dependent on its methodologies*. Since behaviorism was grounded in verifiable observations, it "was a theory and a methodology that satisfied the contemporary requirements for *being* a science." Since behaviorism held as its aims the prediction and control of behavior, it "also satisfied the contemporary requirements for the *uses* of science, that is, the prediction and control of natural phenomena (in this case, human behavior) in the interests of efficiency, order, and progress."

From his criticisms of introspection it can be seen that Watson believed objective, reproducible results were a necessary part of science. His behavior studies relied on specific, observable, objective measures. For example, his "A study on the responses of rodents to monochromatic light" (Watson & Watson, 1913) examined how well rats and rabbits could react to green and red light. The light defined as *green* had a wavelength of 5050, the *red* light a wavelength of 6550. There are three and a half pages of tables (i.e., numerical results) in the fourteen pages of article. There are three clearly proposed hypotheses, which are then tested under carefully described experimental conditions. Each experiment consists of an independent and dependent

* As the methodologies partially determine the subject matter to be studied, the quest to attain scientific methods was also a quest to attain a scientific subject.

variable. Watson avoids making absolute statements: "the evidence seems to justify" or "Experiment II offers good but not absolutely conclusive evidence" (p. 14).

Watson valued numbers, and he seems hesitant to commit absolutely to any particular interpretation of his results. He conducted experiments, and observed the effect of the manipulation of one variable (such as the intensity of green light) on another variable (the behavior of the rat). This is almost a text-book example of an experimental study. For comparison, an introspective experiment largely consisted of presenting a stimulus (such as a picture) to a trained subject, who would then report his (or her) conscious processes. The stimulus could be changed, thus acting as the independent variable whose affects could be measured in the dependent variable (the observer's self-report of their experiences) (Benjamin, 2007, p. 42). While all the parts of an empirical experiment are present, the subjective nature of the results threatens the overall objectivity of the experiment.

Introspection, the opposite of objectivity, was to blame for the imageless thought debate, where the phenomenon observed by one laboratory was denied to exist by another laboratory. Watson was very much aware of this debate, and how agreement could not be reached while relying solely on introspective methods. His discussion of the need for reproducible results follows immediately after his charge that psychology has failed to be recognized as "an undisputed natural science" (Watson, 1913b, p.163).

> If you fail to reproduce my findings, it is not due to some fault in your apparatus or in the control of your stimulus, but it is due to the fact that your introspection is untrained. The attack is made upon the observer and not upon the experimental setting. In physics and in chemistry the attack is made upon the experimental conditions. The apparatus was

> not sensitive enough, impure chemicals were used, etc. In these sciences a better technique will give reproducible results. Psychology is otherwise. (p. 163)

Imageless thought is mentioned by name in the following paragraph. Psychology could not be a science while it relied on a methodology which could not generate reproducible results.

A second requirement for a science is shared definitions. Laments Watson, "there is no longer any guarantee that we all mean the same thing when we use the terms currently in psychology" (p. 164). He gives 'sensation' as an example, spending a full page explaining all the possible attributes and definitions, giving the impression that the method – introspection – is the cause.

A third requirement, implicit in both the demand for reproducible results and shared definitions, is that a science requires a community. Science is done by groups, not individuals. William James would agree: one of his checks against inaccuracy was for different individuals to conduct the same experiments.

A fourth requirement, though never explicitly stated, is that a real science uses apparatus to make its measurements. It uses tools to collect and measure its data, and as a result it generates observable, objective facts. A behaviorist is not concerned with whether a rat sees 'color' the same way the experimenter does; the behaviorist is concerned with the effect of intensity or wavelength in determining the animal's response. He uses equipment to measure wavelengths, not his own eyes. Watson is also concerned with "the necessity for maintaining uniformity in experimental procedure and in the method of stating results in both human and animal work" (p. 170). Uniformity and the use of apparatus both contribute to reproducible results.

A fifth requirement is the focus on the *prediction* of behavior. Physics achieves prediction; physicists have developed mathematical laws which predict, with a high degree of accuracy, the behavior of objects. Similarly, Watson's psychology seeks to observe behavior for the purpose of prediction*.

> My final reason for this is to learn general and particular methods by which I may control behavior. My goal is not 'the description and explanation of states of consciousness as such,' nor that of obtaining such proficiency in mental gymnastics that I can immediately lay hold of a state of consciousness and say, 'this, as a whole, consists of gray sensation number 350, of such and such extent, occurring in
>
> conjunction with the sensation of cold of a certain intensity; one of pressure of a certain intensity and extent,' and so on *ad infinitum.* (p. 168)

The goal is prediction and control, not the description employed in the study of consciousness by introspection. A psychology which allows for prediction and control

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* Prediction alone, while practically useful, is not nearly as interesting as an explanation. Usually, an explanation will contain predictions. Watson was very concerned with control, although he did propose mechanisms to explain his predictions (for example, conditioning and transfer explain how emotional responses develop – see the discussion of the Albert study in Chapter Six). In the preface to the second edition of *Psychology from the standpoint of a behaviorist* (1919/1924), Watson expresses disbelief at the sentiment that "psychology could never be satisfied with anything short of 'explanation'!" (viii). Presumably, introspectionists were the ones proclaiming the need for explanations in psychology, while Watson believed that prediction would be sufficient. His writing is not particularly clear in that portion of the preface.

Predictions and explanations are discussed in more detail in Chapter Seven: On the nature of science.

has obvious practical benefits and applications; a psychology which merely describes has much more elusive uses.

Watson insisted that the principles of studying the behavior of rats could be used to study behavior in humans. Human behavior could be studied without any reference to consciousness; Watson is profoundly unconcerned with what a human thinks in favor of what a human *does*. Questions of perception and sensation can be answered without relying on reports of what a human is consciously aware of, much as experiments can determine which wavelengths of light a rat is sensitive to. Some memory studies were already being conducted under behaviorist principles, even though there was still a focus on introspection instead of observable, behavioral results.

If introspection is unscientific, but if introspection is the only way to observe 'consciousness,' then in order to be scientific psychology must choose a new topic, one which can be studied scientifically. A psychology based on consciousness and introspection "has enmeshed itself in a series of speculative questions which, while fundamental to its preset tenets, are not open to experimental treatment" (p. 176). A psychology based on behavior "is a purely objective, experimental branch of natural science which needs introspection as little as do the sciences of chemistry and physics."

Necessary qualities of a science

In sum, the following qualities of a science can be drawn from Watson's behaviorist manifesto:

1. Results are reproducible. If two laboratories attempt the same experiment, they will get the same result. If they do not, then it is because of some difference in the experimental setup.

2. Terms and definitions have standardized meanings which hold across different laboratories

3. The first two qualities can be extended to note that science is the product of a community

4. The use of apparatus is desirable for its increase in precision, accuracy, and objectivity compared to unaided observations.

5. The focus of a science is on prediction, and by extension, control.

Behaviorism differed from introspection on four of these five qualities (both believed in science as the product of a community). Throughout much of his later writings, Watson repeated and expanded these differences. Watson was adamant in insisting that behaviorism was a natural science, comparable to physics, and that introspection had failed to achieve enough scientific respect.

Reproducible results and standardized definitions

If psychology is to become a science, then the emulation of the respected natural sciences is necessary. "In all other sciences the facts of observation are objective, verifiable and can be reproduced and controlled by all trained observers" (Watson, 1919/1924, p. 1). The need for replicable results was perhaps so obviously necessary that Watson limits his demands for it. When he does stress the need for reproducible results, it is usually in conjunction with an emphasis on the similarities between psychology and all other sciences. He points out that scientists in medicine, chemistry, and physics were making progress (a term only vaguely defined in this context) and that "every new element isolated in one laboratory could be isolated in some other laboratory" (1924/1930, p. 5). He then addresses the same ability within

behaviorism: The problems posed by the behaviorists "can be answered by experiments, and the experiments can be reproduced and the same findings can be had in every other laboratory if the original observation is sound" (p. 7).

> I crave permission to restate the essential contention of the behaviorist. It is this: the world of the physicist, the biologist, and the psychologist is the same, a world consisting of objects – their interests center around different objects, to be sure, but the method of observation of these objects is not essentially different in the three branches of science. (1913a, p. 427)

"You will find, then, the behaviorist working like any other scientist. His goal is to gather facts about behavior – verify his data – subject them both to logic and to mathematics (the tools of every scientist)" (1924/1930, p. 6). As a scientist, the behaviorist brings his subject into an experimental laboratory, and develops questions based on his observations. The questions posed by a behaviorist are not speculative, and "can be answered by experiments" (p. 7).

The first sentence of *An Attempted Formulation of the Scope of Psychology* (Watson, 1917) establishes psychology as a respectable, natural science. While he does not articulate as such the importance of shared definitions, he does provide clear explanations of terms such as 'stimulus,' 'situation,' 'response,' and 'act.' The psychologist studies behavior because behavior is all that can be observed. "All scientific psychology is experimental, or is at least carried out under such conditions that rigid and controlled observation is possible" (1917, p. 346). Laws, predictions, common definitions, and systematic observation are again important to a scientific psychology.

Apparatus

The use and desirability of instruments for measuring variables occurs regularly through Watson's articles. The regularity may be due in part to the fact that Watson used apparatus in many of his experiments, and reported on their inclusion. But Watson also directly emphasized the importance of instruments to the scientific health of psychology. Instruments allow for "adequate scientific control," and the "progress in any science can be measured by the extent to which apparatus and improved methods of observation have been employed" (Watson, 1919/1924, p. 26).

Three years after the Behaviorist Manifesto, Watson reported on a methodology which had the potential to replace introspection, especially regarding sensory problems: the conditioned reflex (1916). Essential to the method of conditioned reflex are both the use of apparatus and the numerical, objective nature of the results. A behaviorist does not measure a dog's salivation by merely watching how much drool drips from the dog. The behaviorist constructs an apparatus which allows for a more precise (and objective) measurement. As much as possible, the possibility of human error or bias is removed from the process of observing results.

Watson likes to present tables of numbers as his results; in this article he provides examples of the raw recordings. When the animal reacted, equipment made note of the reaction, and since the raw data is publishable it becomes possible for experimenters from different labs to study each other's results – and attempt to replicate them.

The use of apparatus is also linked, in Watson's writings, to the natural sciences. "The behaviourist is a natural scientist and makes his observations upon his

fellow man rather than upon himself, utilizing the aid of instruments whenever possible or necessary, like any other scientist" (1920/2009, p. 174). The use of instrumentation is vital: "scientific conclusions demand instrumentation" (p. 175). A subject may, for example, observe that he is using words in his thinking processes, but this self-observation is insufficient for science as it cannot take into account all the myriad of influential but unobservable factors. Training in introspection or psychoanalysis is useless for scientific purposes. The need for accuracy and control hinder self-observation; "self-observation is crude and inexact and [should be] discarded just as soon as other methods can be brought to bear" (1919/1924, p. 41).

Prediction and control

The twin aims of Watson's behaviorism are prediction and control. From Watson's writings, it appears that he regarded the end goals of all natural sciences to be prediction and control. The behaviorist "wants to control man's reactions as physical scientists want to control and manipulate other natural phenomena" (1924/1930, p.11). His goals of prediction and control are achieved by gathering "scientific data by experimental methods." "The behaviorist, like any other scientist, has to make *observations*" to answer scientific questions (p. 20). "Every scientist feels that he makes progress in his field just to the extent to which he can gain control over the material with which he works – as examples: the harnessing of the tide…." (1919/1924, p. 7). This inclusion of the tides is interesting. It is easy to predict the tides – and thus make use of their power – but difficult to explain them. It was quite a while before a scientific explanation for the tides was developed; prediction was much simpler.

Behaviorism, as "the natural science approach to psychology" (p. 4), is "confronted immediately with two problems – the one of predicting the probable causal situation or stimulus giving rise to the response; the other, given the situation, predicting the response" (p. 5). Watson is primarily concerned with prediction, not explanation. To answer these problems, "we need to study man as the chemist needs to study some new organic compound" (p. 6). While the earlier psychology limited itself to consciousness, behaviorism limits itself (although Watson avoids the word 'limits') to the study of behavior. The subject matter and the methodology are linked, and both determine what kind of results are produced: the experimental study of behavior yields conclusions which can be applied towards the prediction and control of behavior.

Psychology will achieve prediction and control through "the experimental manipulation of stimulus and the creation of response" (p. 8). "Here, then, we find a true and legitimate field for experimental study of our human material. It must be experimental and we must some time have laboratories." Watson envisions experiments run with a maximum of experimenter control (and usually a minimum of external validity); the laboratory is thus ideal. Note his association of 'legitimate' with 'experimental' and, to a slightly lesser extent, with the level of control found in laboratories. By extension, if psychology lacked experiments and laboratories, it would not be a legitimate science.

To control an animal, Watson desires extensive knowledge of the animal's basic sensory abilities, such as what wavelengths of light the animal can perceive. In *Behavior* (1914), Watson puts s*ense organ functions* as the first major grouping of animal and human behavior problems, since an understanding of sensory perception is

necessary before problems of instinct or learning (habits) can be examined (p. 32). Questions regarding learning are "the most important group of problems" for the behaviorist "since by means of habit formation he finds the most direct way of controlling animal activity" (p. 45). In addition, "learning in animals" can be applied to "human training."

Practical applications

Watson was fond of stating that "the results of psychological experimentation are as immediately practicable as results in any other scientific field" (1917, p. 345; 1919/1924, p. 17). His discussion of the need for studies in infant psychology (Watson & R. Watson, 1921) begins with a discussion of the practical benefits of such work – possibly as justification for the necessary effort and cost.

Watson was particularly interested in the emergence and development of various instincts and abilities, and the article (Watson & R. Watson, 1921) describes his work with grasping and reaching behaviors, early eye movements, and right and left handedness. A comprehensive body of knowledge regarding the normal emergence and development of various abilities could be used to create a kind of standardized norm against which individuals could be compared. These comparisons would allow the identification of potential problems (such as "feeble-mindedness, deficiencies in habit, and deviations in emotional life," [p. 495]) early enough that reparative changes could be made in the care of the children.

The purpose behind studying infants is to develop the body of knowledge necessary to compare and categorize infants, and the purpose of comparing and

categorizing infants is to better be able to control them as adults. The first purpose is very similar to some of the intentions behind the intelligence tests: to categorize individuals so that they can be better put into certain positions within a larger group. Watson considers the study of infants to be an important part of selecting vocations (p. 495).

> The only reasonable way, it would seem to us, of ever determining a satisfactory knowledge of the various original vocational bents and capacities of the human race is for psychologists to bring up under the supervision of medical men a large group of infants under controlled but varied and sympathetic conditions. (p. 495)

Infant development should be studied, in Watson's view, not just for the acquisition of knowledge but for the practical uses to which the knowledge can be put, for the benefit of both individuals and society.

Laboratory studies versus field work

Watson acknowledges the value of field work, but in his own work he shows a very strong preference for highly controlled laboratory work with isolated subjects kept in sterile conditions. Watson had experience with both settings; he spent four summers observing noddy and sooty terns on the Dry Tortugas islands (Samelson, 1994, p. 13, & Dewsbury, 1994, p. 142). The field work was difficult; the climate was very hot and the birds very loud (Samelson, 1994, p. 13). Watson concludes that field work is necessary but not sufficient for the study of a particular animal.

> General orientation with respect to the daily routine of adjustments of animals and an accurate knowledge of the environmental conditions under which animals live can come only through field observation …. On the other hand, it can hardly be claimed that mere observation of field activity, even when made by competent students, can ever hope to

> answer in any scientific way the basal questions which must be asked about the mechanics of stimulus and response. (Watson, 1914, p. 30)

Field studies are useful for generating questions and as tests that a behaviorist fully comprehends the animal's abilities (p. 31). In addition, despite the desirability of laboratory studies for "accuracy and control in observation," Watson acknowledges that "certain important psychological undertakings [such as in social psychology] probably can never be brought under laboratory control" (1919/1924, p. 27; p. 28). He remarked in 1925 (1925a) that "to check our laboratory results we have watched many of them grow up in their own native habitat – in a natural environment" (p. 14). What this last statement means is that, even if Watson was not much bothered by the effect of unnatural conditions on natural behavior, he was aware that the laboratory conditions could have been a confound. The experimental control gained by having isolated individuals in sterile laboratories was more important to Watson than external validity, even as he admitted that some psychological questions could not be adequately addressed in the lab.

Watson believes that the first step to understanding an animal (and thus being able to predict its responses) is to have a complete grasp of the animal's sensory abilities. To understand the behavior of a rat it is necessary to know what wavelengths of light it can perceive. This level of detailed knowledge can best come from a tightly controlled laboratory setting. Yet Watson carried this preference into his work on the emotional development of infants. He repeatedly stressed the need for controlled environments, and has a rather unique definition of 'natural' behaviors. In order to understand the natural behaviors of animal,

> we take our animal subjects into the laboratory, preferably when they are young (very often at birth), and watch the gradual way in which their instinctive life develops. This gives us a key to what all animals of a particular species naturally and instinctively do – *i.e.*, the acts which they perform without training, tuition, or social contact with their fellow animals. (Watson, 1910, p. 348)

Note that Watson views the "natural" behavior of an animal as that which the animal will display when isolated and contained within a laboratory. He appears unconcerned, in this instance, about any effect this strange and most unnatural environment might have on his test subjects. Instead, he focuses on the increased accuracy and potential for replication which can be gained through laboratory observations. Watson's work on animal behavior starts with the study of perception, abilities which are likely unaffected by the sterile laboratory environment. Indeed, while studying responses to wavelengths and intensity of light, he often worked with animals that had been raised in dark, unlit rooms. "The animal which is trained while young to work in a dark room goes about the task in a perfectly normal manner" (Watson & M. I. Watson, 1913, p. 7).

> Indeed our experience during the past two years at Hopkins has given us complete confidence in the dark room work. Any argument advanced concerning the "unnaturalness of the conditions" should be supported by experimental proof before receiving consideration. (p. 7)

Watson applies the same approach to studying infants. The ideal subject for Watson's infant studies was a child who had spent most of his or her life in the hospital, an environment Watson assumed to be more controlled and sheltered than a typical home. When studying emotions,

> our results seem to show conclusively that when children are brought up in an extremely sheltered environment, such as never is afforded by the home, fears are not present to other stimuli than those which we have already enumerated. (Watson & R. Watson, 1921, p. 509)

Watson's emotional work with infants is high in internal validity (he has reduced the potential of unknown and uncontrolled factors to influence his results) but very low in external validity (the hospital and laboratory create a context unlike that typically found in the real world). Such setups do serve to maximize Watson's control of the experimental situation. The cost is a reduction in the ability to generalize the results: since Watson's infants mostly lived in an atypical setting, their development may not be the same as that of infants in a more typical setting. Watson was successful in his attempt to emotionally condition Little Albert, who had been raised in the hospital and was conditioned in a laboratory, to fear white rats by pairing the animal with a loud noise (Watson & Rayner, 1920). But when Valentine (1930) attempted to replicate Watson's results, studying his own children in the home where numerous social and contextual factors influenced their reaction, Valentine's results did not agree with Watson's[*].

[*] For example, Valentine reported on a time when one of his children encountered a caterpillar. He was able to encourage fear of the animal with a loud whistle, noting that the pairing of the loud sound with an inanimate object (a pair of opera glasses) had no effect (p. 406). In a later trial, Valentine paired the caterpillar with an expression of disgust on his and his wife's part; the child responded by whimpering and turning away (408). Watson acknowledges such social influences primarily as a distraction, factors that overlay and hide "original tendencies" (Watson & R. Watson, 1921, p. 495).

Confidence in the behavior paradigm

Watson began tackling the problem of thought with his July 1913 article on "Image and affection in behavior." Watson could not completely deny mental processes but refused to recognize introspection (and self-observation in general) as a valid methodology; thus, he had to consider thought in behavioral terms. Re-naming mental processes as 'implicit behavior,' Watson proposed that thought was a kind of sub-vocalized speech involving minor movements of the larynx.

> It is implied in my words that there exists or ought to exist a method of observing implicit behavior. There is none at present….If implicit behavior can be shown to consist of nothing but word movements (or expressive movements of the word-type) the behavior of the human being as a whole is as open to objective observation and control as is the behavior of the lowest organism. (1913a, 424)

While the behaviorist cannot observe a subject's thoughts, he can observe that, when faced with a puzzle, the subject does *something* which results in a solution. Merely because the *something* is difficult to observe does not mean that it is not happening. The inference works like this: children and some adults think aloud; others think with a few overt movements of the lips and tongue; and most think without any overt movements. Having observed children and subjects asked to think aloud, Watson asks "what right have I to assume that the [thinking] process entirely changes its character when it becomes implicit?" (1920/2009, p. 176). Thinking may be unobservable, but why assume that the unobservable part of the process is any different from what which can be directly observed? (p. 177).

Note that Watson's implicit behavior could not be studied yet, as the equipment which could measure the minute muscular movements of the larynx did not

exist. This part of Watson's objectively based psychology would have to wait for the right equipment before it could be experimentally and objectively tested. This attitude is typical of new paradigms: problems to which the answer is not immediately apparent are still assumed to be solvable. "To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted" (Kuhn, 1962/1996, p. 18). Normal science, to use Kuhn's phrase for all non-revolutionary science, largely consists of solving the puzzles which the paradigm has hinted at answering. "The success of a paradigm … is at the start largely a promise of success discoverable in selected and still incomplete examples. Normal science consists in the actualization of that promise" (pp. 23-24) by applying the paradigm to the unsolved puzzles. The paradigm provides the focus, directing the scientists' attention to a few esoteric problems which are then studied "in a detail and depth that would otherwise be unimaginable."

In 1916, Watson, realizing that he had published "somewhat impolite papers against current methods in psychology" (p. 89), "felt it incumbent upon me before making further unpleasant remarks to suggest some method which we might *begin* to use in place of introspection." The method Watson is proposing is that of conditioned reflexes.

Studies of animal behavior using the conditioned reflex methods had been quite successful, especially in questions of sensory perception. Watson ties their effectiveness into another push for behaviorism as scientific psychology: because of the great progress made in the last fifteen years when applied to animals, the animal

psychologist must ask "why cannot we study [human] behavior in the same way that we study the behavior of other animals, modifying our methods to suit this new genus?" (p. 90) These methods have proven their effectiveness, and the experimenters are eager to examine new subjects. The conditioned reflex can be used on automatic reflexes, those not under conscious control (and thus inaccessible to introspection), but Watson is forced to admit that he has not met much success in this area.

Watson preemptively counters the criticism

> that this method is useful only in yielding results upon very simple sensory problems. Although I cannot here enter into the wider applications of the method, I am sure that its field will be a larger and wider one that I have indicated. I feel reasonably sure that it can be used in experimentation upon memory, and in the so-called association reaction work, and in determining the integrity of the sensory life of individuals who either have no spoken language or who are unable for one reason or another to use words .... (p. 105)

Throughout his writings, Watson expresses this optimism for the expansion of behaviorist methods. He occasionally expresses complete confidence in his experimental work as well, especially regarding the Little Albert study. Five years later, he discussed that study by explaining how one set of observations "proved to us conclusively that the classical illustrations of hereditary responses to furry objects and animals are just old wives' tales" (1925b, p. 43). He describes the Albert study as "proof of the conditioned origin of a fear response" (p. 52) which "puts us on a natural science grounds in our study of emotional behavior." "Natural science grounds" are in contrast to both James (p. 53) and Freud (p. 57).

Consciousness-based psychology's failures as a science

Watson identifies three main failures of consciousness-based, introspective psychology which necessitate a major change in the way psychology is done. First, a consciousness-based psychology has failed to achieve recognition as a science. Watson stated this most firmly in his 1913 Behaviorist Manifesto (1913b). Second, a consciousness-based psychology does not lend itself to practical applications (or control). Thirdly, a consciousness-based psychology, separately from its failures to achieve recognition or provide practical uses, is simply not objective enough to be scientific.

The theoretical goals of Watson's behaviorism were practical applications – prediction and control. His arguments for the establishment of an experimental nursery are based in practical terms: once psychologists have studied the development of infants, creating a set of standards for what constitutes normal development to which all other infants can be compared (Watson & R. Watson, 1921). In his 1917 article "An attempted formulation of the scope of behavior psychology," Watson discusses the relationship between psychology and medicine. Psychology "should form a background for the whole field of medicine. But it has dealt hitherto so largely with speculation and with philosophical considerations that its usefulness for this purpose has been seriously restricted" (pp. 349-350). A scientific psychology would therefore be less concerned with 'philosophical considerations' and, at the same time, be practically useful.

Watson provides the most thorough discussion of psychology's past failures to be recognized as a science in *Psychology from the Standpoint of a Behaviorist* (1919/1924).

> Psychology, up to very recent times, has been held so rigidly under the dominance both of traditional religion and of philosophy – the two great bulwarks of medievalism – that it has never been able to free itself and become a natural science. (p. 1)

Introspection was an unsuccessful attempt at a science, because of "its limitation of subject matter and choice of method." Consciousness is "not objectively verifiable and for that reason can never become data for science." The "data of science (verified observations) are common property"– they can be shared among the various sciences (p. 2). Thus both a physiologist and a physical chemist can study the same hormone. The descriptions and analyses resulting from introspection cannot be shared, either within psychology or across the sciences (p. 2). "Since no other human being can make an introspective observation upon anyone but himself," conclusions regarding mental states "matter not one whit to that organized body of world-wide data we call science" (p. 3).

Some comments on the role of observations and speculation.

Observation, both with and without instruments, is the first of the "objective methods" Watson describes in *Psychology from the Standpoint of a Behaviorist* (1919/1924, p. 24). Observation

> becomes a genuine scientific method only when [the observer] puts his results down and begins to note exceptions, to draw tentative conclusions, and then to gather new observations to check up such

> conclusions …. Such data must be subjected to statistical methods before conclusions can be verified. (p. 25)

Speculation is part of science as long as the speculation will eventually lead to experimental analysis – and the support (or lack thereof) of objective, observable results. Speculations must be judged in terms of experimental support, not metaphysics (and perhaps by extension, all philosophical arguments). Watson has "no sympathy with those psychologists and philosophers who try to introduce a concept of 'meaning' ('values' is another sacred word) into behavior" (1920/2009, p. 179). It is sufficient to merely observe behavior and actions. "The question of meaning is an abstraction, a rationalization and a speculation serving no useful scientific purpose" (p. 180). Meaning is not important in the prediction and control of behavior; therefore, Watson regards it as useless.

Chapter 5

PSYCHOLOGICAL SCIENCE DURING THE FIRST WORLD WAR

John Watson was not alone in his desire to create a new, scientific psychology with immediate and practical applications. A number of psychologists, including John Watson and Robert Yerkes, saw the First World War as an opportunity to demonstrate the practical benefits of a scientific psychology. Numerous committees were established, including the Committee on Methods of Psychological Examining of Recruits chaired by Robert Yerkes (Samelson, 1977, p. 276). The committee was responsible for the design and implementation of the Army Alpha and Beta mental tests. The psychologists viewed the mental tests as a rousing success, a symbol of the vast possibilities of their discipline. However, on closer examination, the mental tests were not very successful in terms of adequately testing the army recruits or in influencing the army's actions during the war.

The army mental tests had such an impact on psychology that a thorough discussion of them is worthwhile, even though Watson was not directly involved with the testing efforts. The mental tests embodied a desire for a practical, scientific psychology, much as Watson campaigned for. Watson's work was with selecting and training aviators, of which little resulted except, at war's end, an "enhanced reputation" and international connections (Buckley, 1989, p. 105 - 106).

Intelligence testing in the First World War

Robert Yerkes campaigned for, and won, the opportunity to give all military personnel his version of the Stanford-Binet intelligence test. The resulting wide-scale testing of new recruits was considered "less than successful from a scientific point of view" by many psychologists, and yet was wildly popular (p. 107). Businessmen and educators alike were intrigued by the claimed ability to quickly measure intelligence. "Ironically, psychology gained recognition as a science to the degree that it removed itself from the laboratory and demonstrated its usefulness in applied fields" (p. 107). The real irony is that psychology enhanced its status a science through the use of poor scientific methods.

Psychology's involvement with the war "had profoundly altered the discipline's status as a science and a profession" (p. 110). "John B Watson's earlier critiques of the underlying assumptions of psychology and his vision of a science of behavior control were instrumental in laying the groundwork for the professional structure that emerged after the war" (p. 111). Robert Yerkes observed that "psychology today occupies a place among the natural sciences which is newly achieved, eminently desirable, and highly gratifying to the profession" (qtd. in Buckley, 1989, p. 110). "Mental engineering" had become a highly marketable and successful "branch of technology" (Yerkes, qtd. in Buckley, 1989, p. 110).

Much of this success was due to Yerkes' intelligence testing, despite its significant scientific handicaps. The intelligence test is often misunderstood and so requires an introduction. The methodology shapes what is studied: to design an

intelligence test is to assume that intelligence is a single thing which can be determined by an individual's response to test questions.

The inventor of the intelligence test, French psychology Alfred Binet, was wary about making these assumptions (Gould, 1996, p. 181). He did not assume that intelligence was a single, innate thing which could be used to rank individuals, and he was troubled by the potential harm that could result from self-fulfilling prophecies or other erroneous assumptions drawn from IQ. The sole purpose of the Binet intelligence test was to identify young people with inferior mental abilities who would benefit from specialized education.

The mental testers of America shared none of Binet's hesitancies or concerns. The result has been described as "a major misuse of science" (p. 185).

> American psychologists perverted Binet's intentions and invented the hereditarian theory of IQ. They reified Binet's scores, and took them as measures of an entity called intelligence. They assumed that intelligence was largely inherited, and developed a series of specious arguments confusing cultural differences with innate properties. They believed that inherited IQ scores marked people and groups for an inevitable station in life. And they assumed that average differences between groups were largely the products of heredity, despite manifest and profound variation in quality of life. (p. 187)

In 1916, American psychologist Lewis M. Terman revised Alfred Binet's tests into the Stanford-Binet intelligence test, which was intended to rank large numbers of normal children and laid the foundations for Yerkes' mass testing of army recruits.

Yerkes shared Watson's desire for a scientific psychology, one on equal standing with physics. "Yerkes and most of his contemporaries equated rigor and science with numbers and quantification" (p. 223). Mental tests produced numerical

results: clearly mental tests were therefore scientific. The army was an excellent source of subjects; Yerkes would be able to gather enough numerical data to legitimize intelligence testing and further psychology's progress towards scientific respectability. He tested 1.75 million recruits with three varieties of intelligence tests: The Alpha test for literate recruits, the Beta for illiterate (and those who failed the Alpha), and individualized examinations for those who failed the Beta. After analysis, these tests revealed that most Americans were of low intelligence, most European immigrants were even lower, and blacks were the lowest of all. Yerkes assumed that these low figures were due to innate and inevitable defects in mental ability.

Flaws in Yerkes' intelligence tests

When the war ended, businesses and schools created a high demand for mass intelligence testing, and psychology had finally achieved a measure of scientific respectability. But when Yerkes' ambitious mass testing is more carefully examined, it becomes obvious that whatever Yerkes was practicing, it was not science. The tests were administered by a qualified psychologist, and they produced a large quantity of numerical measurements, but these factors were not sufficient for good science.

First problem: The content of the tests. Ever since Terman revised the Binet scale, there had been "no independent confirmation for the proposition that tests measure intelligence" (p. 207); all an intelligence test had to do was to correlate well with Terman's Stanford-Binet test. Yerkes' Alpha test measured innate intelligence with multiple-choice questions like:

Crisco is a: patent medicine, disinfectant, toothpaste, food product.

> The number of a Kaffir's legs is: 2, 4, 6, 8
>
> Christy Mathewson is famous as a: writer, artist, baseball player, comedian (quoted in Gould, 1996, p. 230)

It should be obvious that such questions measure cultural familiarity. The pictorial Beta test was hardly any better; one complete-a-picture question required adding a bowling ball to a man's hand – and not in the alley, because the position of the man's hand clearly reveals that he has not yet released the ball.

Even those questions which truly relied on what could be more reasonably assumed as common knowledge (such as adding a mouth to a human face) still required handling a pencil effectively – a task many of the recruits were unfamiliar with. It should again be obvious that a lack of familiarity with pencils is not an accurate measure of innate mental ability.

Second problem: The conditions under which the tests were administered. These conditions varied tremendously, a serious problem when the goal is to compare test scores across different pools of subjects. There was no set standard – not even an established criterion for literacy – for assigning recruits to either the Alpha or the Beta tests (p. 233). Many who should have taken the Beta took only the Alpha test and, being illiterate, scored abysmally low. The demand for the Beta tests was higher than Yerkes had expected (and planned for), and in practice it was very difficult to arrange a Beta retest for those who failed the Alpha.

Even when the procedures were followed correctly, the resulting test experience was far from ideal. The Beta testees were not told the purpose of the test, nor were they informed that they were not expected to finish every section. They were encouraged to work as quickly as possible, repeatedly told to "do it, do it, hurry up,

quick" (taken from Yerkes' explanatory materials for the examiners, quoted in Gould, 1996, p. 237).

> In summary, many recruits could not see or hear the examiner; some had never taken a test before or even held a pencil. Many did not understand the instructions …. if anxiety and confusion had not already reached levels sufficiently high to invalidate the results …. add to this the blatant cultural biases of test 6, and the more subtle biases against those who could not write numbers or who had little experience writing anything at all, and what do you have but a shambles. (Gould, 1996, pp. 240-242)

The end result of Yerkes' mental tests of army recruits is today referred to as "a shambles" – which is another way of saying "bad science." The conditions under which the mental test results were acquired should have been recognized immediately (and were, to some extent; see below) as poor scientific procedure. The mental test has all the appearance of valid science: it is not introspection, it seems to be objective, it uses apparatus (the questionnaire), and it produces numerical results. Numbers are the ultimate objective measure; Watson often presented his experimental results in numerical tables. But Watson understood the importance of carefully controlling the experimental conditions (Watson, 1913b). The arguments between introspective laboratories over imageless thought (and the inability of either side to produce evidence which convinced the other) was a clear signal that introspection was not a valid scientific methodology. Behaviorism, on the other hand, relied upon reproducible, observable measures and was thus more scientific than introspection.

Yet Yerkes' tests fail most of these criteria. The testing conditions were varied and uncontrolled. No effort was made to test subjects under various kinds of conditions to demonstrate that the tests were valid. Yerkes' procedure called for the

retesting (using the Beta test) of recruits who had failed the Alpha, and another retest (using individual examinations) for those who had failed even the Beta test. When this procedure was followed, scores "improved substantially" (Gould, 1996, p. 233), but the logistics of performing these retests quickly became impossible.

Yerkes' mental tests actually lacked any sort of justification for being measures of mental worth. The scientists instead assumed, without evidence, that there was such a thing called intelligence and that their tests measured it accurately. These kinds of assumptions are very dangerous to science, because they are often more unconscious biases rather than deliberate decisions. Yerkes was operating under a paradigm in which the world operated in such a way that intelligence existed as a quantifiable entity that varied between racial groups. He did not question the way he viewed the world as working when he designed his mental tests, and he even ignored or rationalized away any inconsistencies between his results and his assumptions.

Many of the recruits scored a zero on many of the various parts of the tests. For six of the eight Alpha sub-tests, the most common score was a zero. "The common-sense interpretation of numerous zeros suggests that many men didn't understand the instructions and that the tests were invalid on that account" (p. 244). Yerkes and his assistant E.G. Boring clung to their unquestioned beliefs that the tests measured intelligence (and, perhaps, that most people were unintelligent, especially if they belonged to some other race). They interpreted the large number of zeros to mean that the recruits were even stupider than expected; surely, they proposed, many of these recruits would have scored even lower if there had been even easier questions for them to fail. This was their interpretation despite the fact that Yerkes was aware than

individual examinations sharply reduced the number of zero scores. If the scores vary greatly over different conditions, then it is the conditions and not the individual which are primarily responsible for the results.

Yerkes performed similar feats to analyze away correlations between scores and environmental factors. He decided that, since recruits with advanced schooling scored higher than less educated recruits, intelligence must determine the extent of schooling an individual attends. Nor was Yerkes alone in utilizing such rationalizing feats. Gould's book, *The Mismeasure of Man*, is full of examples of mental testers who managed to fit their data into their prior assumptions.

A study of the history of mental testing is a study of the ability of researchers to use numbers to prove their initial positions, even when alternate explanations are clearly possible. A lesson can be learned from this study: numbers alone cannot validate a hypothesis. The conditions under which the numbers are obtained are vitally important.

As was mentioned earlier, there is some evidence that the poor scientific quality of Yerkes' intelligence testing was noticed at the time. The examiners were aware that the testing conditions were less than ideal (p. 231), and that many recruits who should have been tested using either the Beta test or individual examination instead only took the Alpha (p. 233). The examiners knew that many of the recruits had never held a pencil before (p. 234). They worried about the number of zero scores, under the interpretation that zero scores indicated poor explanations and a general failure to get the idea across (p. 246). One psychologist involved noted that the

standardized instructions were "perfectly incomprehensible" and that alternate explanations resulted in better scores (qtd. in Samelson, 1977, p. 280).

In 1922, while reviewing an early draft of C. C. Brigham's *A Study of American Intelligence* (which used the army data as "a scientific basis" for "the study of race differences in mental traits" [Brigham, qtd. in Gould, 1996, p. 254]), Brigham's conclusions were questioned by now-prominent psychologist E. G. Boring, who had assisted Yerkes in the initial data analysis. Boring wrote to Yerkes, inquiring if immigrants might have received low scores because they had difficulty understanding the American style of the test instructions. "Was it their intelligence or their lack of assimilation to the American setting?" (Boring, qtd. in Samelson, 1979, p. 148). This is a criticism of the validity of Yerkes' intelligence tests: were the tests actually measuring 'intelligence,' or were they measuring something else?

Brigham's response is enlightening, at least in terms of how one can defend a position against reasonable criticisms. He declared, in *A Study of American Intelligence*, that "the adjustment to test conditions is part of the intelligence test;" furthermore, "inability to respond to a 'typically American situation' is obviously an undesirable trait" (qtd. in Samelson, 1979, pp. 148 – 149).

Yerkes still published his results as if his tests were accurate measures of an innate, inherited intelligence. His published results provided "the scientific evidence for what everybody except a few sentimentalists had known before" – the existence of racial differences in intelligence (Samelson, 1977, p. 277). This 'fact' fit perfectly with Yerkes' worldview; he knew that intelligence existed, that it varied between racial

groups, and that blacks were much less intelligent that whites. This worldview was widely shared, and had immediate use to further various political plans.

> It needs to be emphasized that such interpretations of the Army data were not made only by publicists and politicians taking information out of context and exploiting it for their own purposes. These results were reported as scientific findings by the psychologists themselves (although usually with some qualifications and calls for further research - which, after all, was their career). (Samelson, 1977, p. 278)

Psychology after the war

Despite the unscientific nature of the army intelligence tests, psychology prospered as a result of Yerkes' efforts. "The army intelligence tests have put psychology on the map" (Cattell, qtd. in Samelson, 1979, p. 106). There was high demand for more intelligence testing; the idea of a National Intelligence test to measure the IQ of schoolchildren received a $25,000 grant (Samelson, 1977, p. 277). By 1919 psychologists were being appointed heads of important national research organizations, enrollment in psychology classes was booming, and groups from schools to businesses to industries were asking psychologists for advice (p. 275).

Psychology had received public recognition as a science which could provide a useful and necessary service, and much of its reputation was built on the army intelligence tests.

> Altogether, it had been shown that the application of large-scale psychological testing could result in a huge increase in the efficiency of an organization like the Army and produce savings of millions of dollars to the government. (Samelson, 1977, p. 277)

Or so the claim went. Unfortunately there was not much hard evidence to support any of the claims made from Yerkes' mental testing campaign. Yerkes' interpretations

were abandoned* (often in less than two decades), and there is little to indicate that the army actually used the data in any sort of efficiency-increasing, money-saving way – or in fact used the results at all. The test scores correlated reasonably well with performance judgments made after training, but the correlations fell when the performance measures (as decided by officers) were made after the war (Samelson, 1979, p. 146). No large scale efforts were made after the war to compare the predicted performance, based on the intelligence test results, with actual performance, as judged by the officers (p. 147). While the psychologists gathered testimonials by officers praising the mental tests, negative or indifferent responses were also common (p. 145).

The army was generally unsatisfied with the results of the psychologists' mental testing efforts, perceiving quite a bit of cost and effort which did not produce practical results (p. 151). After the war, the psychological service was abolished. The psychologists' basic assumptions in approaching and designing the intelligence tests for the army may have contributed to the army's dissatisfaction. The psychologists believed that their tests were accurate measures of an innate and biologically based intelligence which was the "crucial, if not exclusive, determinant of human performance" (p. 153). Not only were the effects of training and education ignored,

*It is worth noting that a number of the firm believers in an innate, inherited intelligence ended up recanting these beliefs by the end of their career. For example, H.H. Goddard and Lewis Terman (who had created the Stanford-Binet test), both discussed in Gould's *The Mismeasure of Man* (1996). C.C. Brigham, who worked closely with Yerkes and whose1923 book *A Study of American Intelligence* "became a primary vehicle for translating the army results on group differences into social action" (Gould, 1996, p. 254) recanted six years later.

but this approached denied that any other kind of attributes or skills were major factors in determining how well soldiers would perform.

Despite the initial rush of requests for psychological advice, the application of psychology to businesses and industry proved rather similar to the application of psychology to the military. Psychological tests generally failed to significantly increase profits, and "such clear-cut results seem to have discouraged many business firms" (Samelson, 1979, p. 116).

Psychological tests remained popular in education. Yerkes and Terman imagined two levels of involvement: first, psychology would provide technical expertise (tests), and secondly, as a result of these tests, a vast reorganization of the educational system as students could be tracked into their most appropriate classes (and careers) (p. 112). The National Intelligence Test was designed and administered in the 1920s – and possessed about the same level of scientific quality as the army tests. In order to fairly test children from various backgrounds and locations, norms would have to be provided for comparison. While recognizing the need for different norms, the psychologists were apparently unable to acquire them. Instead, they used schools in Washington D.C. and Pittsburgh and established "a single norm for the country … based on white urban children" (p. 113). In 1937, Terman revised his Stanford-Binet intelligence test by removing all items which showed sex differences. Ideology (or assumptions or biases) "emerged at the technological level of the tests, by selecting test items to produce the expected results, and by setting up a single, and arbitrary, universal performance standard based on the white majority" (p. 114).

The experience of the army intelligence tests had a profound effect on American psychology, beyond the publicity and subsequent rising in both public and scientific awareness. The nature of the discipline changed. 'Intelligence' had become defined primarily as that quality which allowed an individual to score well on a test of some sort. "This transformation of our conceptual world – achieved by equating reality with measurability and the instruments of measurement … may have been the most pervasive effect" of psychology's war work (Samelson, 1977, p. 155). This definition of an abstract quality as 'that which is measured by this test' was to be "officially designated as a cornerstone of modern psychology" as the "operational definition" (p. 158).

The obvious moral of the story is that it is quite easy for scientists to design experiments which provide support for their assumptions, even if those assumptions do not match up well with reality. Bias can strongly influence apparently objective results. A secondary moral is that a study may produce what appear to be scientifically valid results without engaging in scientifically valid experimental design – and valid results cannot come from invalid experimental design. The intelligence tests appeared scientific: they produced numerical results using a standardized apparatus. But numbers are just numbers: they can be interpreted in many different ways, and require context to be properly understood. A test score, by itself, is meaningless without an understanding of how the test was constructed (and presumably validated against some external measurement) and taken. The army data was questioned

somewhat even as it was being produced, but the data was still published. It *looked* like good science – and it matched up with many of the prevailing attitudes of the time.

The army mental tests are now generally viewed as an example of poor science. Most of the proponents have recanted. A textbook on psychological measurement and evaluation devotes a three-sentence paragraph to the army mental tests, and then lists the advancements made in studying intelligence. Specifically, "the construction of new and more accurate batteries of tests" (implying a distinct lack of accuracy in the World War I tests) and "improvement in the norming and standardization of these tests" (Sax, 1997, p. 368). There are now several theories as to what is meant by 'intelligence,' from single-factor theories (such as those held by Yerkes et al) to multi-factor concepts.

Good science is clearly more than merely using a standardized apparatus that produces numerical results. Standardized conditions are also important, as is the process of ensuring that an apparatus (such as a questionnaire) actually measures what it is supposed to be measuring. Questionnaire design is not a simple process: the set of questions must be tested for both reliability and validity. There are, as has already been mentioned, entire textbooks devoted to the design of good tests. Even statistical analyses have become more intricate.

Psychology has changed over time. The focus of the field has shifted, and the procedures guiding experimental design have become more detailed and inclusive. It is as if the standards of what makes good psychological science have risen. This is not a new process: John Watson was part of it. He looked at the introspection-based psychology and demanded a more scientific approach. A methodology which produced

the debate over imageless thought could not be good science; good science required greater objectivity and replicability. It is now possible to do the same with the army mental tests: to look at the methodology which produced them and demand that a good science have more controlled conditions and greater validity and reliability.

Chapter 6

EMOTIONAL CONDITIONING: 'LITTLE ALBERT'

The experimental nursery

Watson's experiences during World War I – and the role he had seen psychology play in the war – lead him to believe in "an enlarged role … for psychology" (Buckley, 1989, p. 113). Psychology was applying itself to issues within education and the general raising (or perhaps 'training' is a better word) of children. American society had undergone a drastic shift during the war, and psychologists were among the experts who were seen to be best capable of handling and directing these changes. Behaviorism was superbly adapted to practical application; society was more concerned with how a man behaved than how he thought (Watson, 1918, p. 54). In order to understand human behavior, it was necessary to start at the beginning: the study of infant development. An experimental nursery could provide mothers with "expert guidance and intelligent help" (p. 81).

Around 1916, Adolf Meyer offered Watson the chance to set up an experimental nursery at the Johns Hopkins Medical School (Cohen, 1979, 101). Watson enthusiastically responded to the chance to study the development of reflexes in infants; he hoped that the conditioned reflex would show itself as the root of all human emotional responses (Buckley, 1989, p. 89). If this was the case, Watson could develop a methodology which would not only allow for the study but also the *control*

of emotional development. Such ability would have tremendous use and application within society (p. 94). Watson granted the emotions immense power, and was convinced that emotional control was vital for individual efficiency and productivity (p. 120).

The experimental nursery would allow Watson daily observation of forty infants, from birth onward. "He would record their movements, their reactions to certain stimuli and chart their maturation. No one had done that before" (Cohen, 1979, p. 102).

> I see no way of gaining the information we so much desire except by the use of slow and intense experimental methods …. Most of the questions which now agitate us and which we settle by theory could be answered by experimental results. (Watson, 1918, pp. 77-78)

Such a wealth of observational data would be far more useful (Watson specifically says "far more scientific" [p. 78]) than any sort of intelligence test.

Watson hoped to identify the infants' unlearned responses, the base which would allow for conditioning. Among his studies and observations, Watson noticed the similar reactions most infants had to loud noises and the loss of physical support (i.e., being dropped): the catching of breath, arm and leg movements, and closing of hands (Cohen, 1979, p. 116). Watson interpreted these responses as fear. He noted that, contrary to popular opinion, infants were not afraid of animals, but rather curious and would watch intently or reach out towards animals (p. 120). Further observational studies revealed that infants generally tended to reach out towards and manipulate any small object (p. 121). He also observed the case of an infant who had a single terrifying experience with a small dog and was then not only afraid of dogs but other animals as

well, and even moving mechanical toys (p. 121). It seemed as if fears of one thing could be transferred to similar things. From these observations of naturally occurring events Watson designed experiments to study the phenomena in greater detail and control. In the winter of 1919-1920, Watson attempted to emotionally condition an eleven-month old infant called Albert. The 'Little Albert study' is perhaps Watson's most famous experiment, as it is the foundation of his theory of emotional conditioning. Due to its importance, the Little Albert study warrants a thorough discussion.

Little Albert

Watson claimed to have successfully conditioned Albert to fear a white rat through repeated pairings with a loud, frightening noise. Albert was initially frightened of loud noises but not of rats, and at the end of study expressed fear of not only the white rat but white furry objects in general. These results "demonstrated that emotional reactions could be conditioned to respond to stimuli arbitrarily chosen by the psychologist" (Buckley, 1989, p. 122).

Watson published his results, "Conditioned Emotional Responses" with R. Rayner in early 1920. The experiments with Albert were to provide experimental support for Watson's hypothesis that infants expressed three basic emotions (fear, rage, and love) which were expanded, probably through childhood, to the complexity of emotions experienced by adults (Watson & Rayner, 1920, p. 1).

First, Watson demonstrated that Albert was unafraid of various stimuli, including a white rat and a rabbit, and was afraid of the loud noise produced by striking a steel bar with a hammer. Watson recorded many of the trials using motion pictures,

and was always careful to objectively describe his observations. One potentially important observation was mentioned only at the end of the article, under "Incidental Observations," and not discussed in the context of the article. The historian Franz Samelson (1980) was particularly upset by this; his concerns will be discussed below. While the observations included in the article are well described, the possibility of subjectivity still exists in selecting which observations to report. The conditioning process was straightforward but not simple; Watson repeatedly had to 'freshen' Albert's fearful reaction to the rat by striking the iron bar again. Watson was careful to note when the reaction had to be freshened, although the need for the repeated association does not seem to support Watson's theory of conditioning emotions.

The article clearly describes Albert's fear reaction, usually listing several definite behaviors (such as falling over to one side or another, crawling away, crying, etc.) which Watson interpreted as fear. He has no other evidence that Albert was afraid except for his actions; there are no independent measures of validity, and no explanation or reasoning for why certain behaviors mean that Albert is afraid. But Watson is a behaviorist: for him, behavior was all that mattered. It is reasonable that a theory concerned only with behavior and actions is satisfied with defining emotions in terms of behavior and actions. However, Watson reports not just his subjective interpretation (e.g., Albert is afraid of the rat) but Albert's exact behavior (e.g., Albert fell over and crawled away). Watson was generally satisfied that verbal descriptions of behavior were objective results.

When Albert was 11 months old, Watson paired the loud noise with the rat. He carefully notes exactly when the bar was struck (for example, when Albert

reached out and touched the rat) (p. 4). Two sets of trials a week apart (with a total of seven paired trials) were necessary to create an emotional response of fear towards a previously neutral object. Watson claimed "this was as convincing a case of a completely conditioned fear response as could have been theoretically pictured" (p. 5).

After five days, Albert was still afraid of rats. He was also afraid of rabbits, demonstrating that transfer had taken place (he was not, however, afraid of the experimental room, for he played happily with his blocks between trials with the rat and the rabbit) (p. 6). This transfer applied to dogs, seal fur, and Santa Claus masks, but not cotton wool. After another five days, Albert showed a reduced reaction to the rat. In all cases, Watson describes his observations, rather than conclusions. Periodically, the animal and the noise were paired, to 'freshen' Albert's reaction (pp. 7, 8). Albert was also tested in a different room: he generally showed less fear, but was still hesitant around the animals. Once again his responses were 'freshened' and again Albert showed fear (p. 9).

A month was allowed to pass before the next set of emotional tests, to judge the effect of time on conditioned emotional reactions. Watson was at this time aware that Albert would be leaving the hospital in a month, and that this was Watson's only chance if he was going to test the persistence of the conditioning. After thirty-one days, Albert responded fearfully to the Santa Claus mask and a fur coat, and also to the animals (pp. 10, 11), although Watson comments that the child's reactions to the animals were not as strong as before. Unfortunately, Watson was not able to conduct any further studies, and had no opportunity to de-condition Albert.

Watson had designed this study to find support for his theory that emotions were conditioned, and he declared a success.

> These experiments would seem to show conclusively that directly conditioned emotional responses as well as those conditioned by transfer persist….Our view is that they persist and modify personality throughout life. (p. 12)

Despite being supported only by a single study using a single subject, Watson continued to express full confidence in his theory of conditioned emotional responses. His "Studies in Infant Behavior" (Watson & R. Watson, 1921) claimed that the Little Albert study was "as convincing a case of a completely conditioned fear response as could have been theoretically pictured" (p. 512).

Other laboratories' efforts at emotional conditioning

Watson published his experimental results in *The Journal of Experimental Psychology*. A decade later, the results of other laboratories' attempts at emotional conditioning were published and made available to the psychological community.

In 1930, Horace B. English, aware of the theoretical implications of Watson's study and desiring additional experimental evidence, published his own studies as "Three cases of the 'conditioned fear response.'" The first case consisted of observations, in the home, of an infant demonstrating a conditioned fear response to a toy. As the loud noise was not repeated in conjunction with the toy, the infant lost her fear within forty-eight hours (p. 221). Watson repeatedly had to 'freshen' Albert's fear response during the conditioning period, and based his claim of having conditioned a long-term fear on less than two months of experimentation.

In the one laboratory study, English's subject completely failed to be afraid of a loud noise (created in the same way as the noise which had frightened Albert). English concludes that "in none of these cases do we need to suppose that the fear response is conditioned by association with an original stimulus of a loud noise" (p. 225). Watson believed that scientific experiments must be replicable: if two laboratories follow the same experimental procedure, the results should be the same. If the results differ, the reason lies within the experimental conditions – and *not* with the researcher*. There is some difference between the experimental procedure, stimulus, or subject which leads to dissimilar results. English's study indicates, at the very least, that emotional conditioning is not as simple as Watson maintained. Albert's reaction cannot be generalized; while he learned to fear white fur, other children may not.

A second 1930 study by C. W. Valentine addressed "The innate bases of fear," in direct response to Watson's findings with Albert. Valentine discusses the difficulty in identifying an emotional reaction from external behavior, particularly in children; the experimenter can either look for behavior similar to that expressed by adults, or judge that a situation should be causing fear and label the child's behavior as an expression of fear (p. 395). An assumption is still required to label the child's behavior as 'fear.' "As it seems to me, all our understanding of terms expressing fundamental elements of human experience involve both the observation of others and a reference to inner experience" (p. 396).

* See Watson's discussion of the imageless thought debate (1913b, p 163).

Valentine was attempting to disprove Watson's claim that fear is a conditioned response by showing "that [Watson's] conclusions are unreliable" and providing evidence for innate fears (p. 397). Valentine observed his five children over a period of several years, noting their reactions to a variety of sounds (especially loud, sudden, and novel noises). These observations were of naturally occurring sounds in the home; such a procedure reduces experimental control to the extent that no causal effects can be identified but greatly increases the external validity of the study. This natural environment allowed Valentine to note that fear is not a simple reaction to a stimulus; other situational factors, especially the presence of the mother, had a large effect on whether or not a fear response was shown (p. 401).

Valentine argues that Watson's experiments, while showing how an infant may learn to fear an animal, "do not prove that all such fears in later childhood are based entirely on experiences and are really conditioned reflexes" (p. 404). Just because Watson did not observe an innate fear in an eleven-month-old child does not mean that such an instinctive fear may not mature and come into effect as the child ages. Innate fears may exist, mature, and then be called forth "by some slight shock or disturbing incident" (p. 405).

Having observed his children express fear at toy animals, Valentine decided to conduct some tests similar to Watson's conditioning experiments, using both a neutral stimulus (a pair of opera glasses) and a live animal (a caterpillar). His results demonstrate that fear is complicated and easily affected by confounding variables. The infant was not afraid of either the opera glasses nor the loud whistle Valentine used as the loud, sudden sound (Watson had stated that loud noises were an innate fear). The

caterpillar did not trigger a fear response until the creature had been paired with the whistle (p. 406). These tests were conducted in the home.

Valentine argues that some of Watson's own experimental observations (conducted in more controlled and also less externally valid situations) fit better with a theory of innate fears rather than conditioned fears. Watson's explicit descriptions of his observations allowed Valentine to integrate Watson's observations into an alternate theory. Valentine's alternate theory had to be able to explain both Watson's and Valentine's observations; the increased experimentation by Valentine lead him to develop a more complex theory.

In 1934 Elsie Bregman published her account of "An attempt to modify the emotional attitudes of infants by the conditioned response technique." She attempted to condition the infants using an electric bell, which triggered a startle reflex (p. 172), and with the positive reinforcement of either a toy rattle or a soothing piece of music. Perhaps as a result of English's work, Bregman interpreted the infants' reactions to the sudden noise as being startled rather than being afraid. Bregman devised a record-keeping system which allowed for quick notation of the infant's exact behavior (p. 178) (quite likely a more objective system that Watson used to record Albert's responses). Responses were given numerical values (p. 181), and preliminary trials were run to ensure that the infants found the electric bell a disagreeable stimulus and the red rattle and music agreeable (p. 184). One set of neutral stimuli was then paired repeatedly with the unpleasant noise (as per standard conditioning practices), and another set paired with the agreeable stimuli. The neutral stimuli included wooden blocks and rings of varying sizes and yellow curtains. After the conditioning period, Bregman

found no significant differences in the infant's responses to the stimuli, despite the fact that half of the stimuli had been paired with the startle noise and the other half with the agreeable stimuli.

> We are therefore led to conclude that changes in emotional behavior, in attitude and interest, are not as a general rule, at least, readily brought about by joint stimulation in early life, and that conditioning *per se* cannot be accepted as the cover-all explanation of the emotional modifications which take place during the period. (p. 196)

Contemporary attempts to replicate Watson's results with Albert indicate a general lack of support for the theory of conditioned emotional responses. The infant in English's study was unafraid of the same kind of loud noise which Watson had used successfully with Albert, and unsurprisingly could not be conditioned to fear a neutral toy. Bregman, using a different noise, succeeded in startling her subjects but could not condition them to fear neutral objects. Neither English nor Bregman used live animals; Valentine tested his children with live animals, but as his experiments were not in the laboratory, he was able to note a variety of confounds which influenced emotional responses.

Watson was able to create a conditioned emotional response in Albert, but the failure of other psychologists to replicate his results indicates that emotional conditioning is more complex that Watson initially envisioned.

Fifty years later

In 1979, Ben Harris carefully examined both the Little Albert study and the ways various psychologists had understood and described the study since it had been conducted. "From information about Albert himself to the basic experimental methods and results, no detail of the original study has escaped misrepresentation in the telling and retelling of this bit of social science folklore" (p. 151).

The Little Albert study, in 1920, was not the first empirical study Watson conducted on conditioned reflexes, but it is the most famous and the most successful[*]. Harris observes that most undergraduate textbooks on general, developmental, and abnormal psychology mention the Albert study – yet many of them contain various degrees of inaccuracy (p. 153). Even prominent behavioral therapists misinterpret the study (p. 154). Part of the difficulty, Harris notes, is that Watson himself gave differing reports of the study, often neglecting important steps or speculating about the long-term effects (p. 154). In addition, there is a tendency to fit the data into the shape demanded by the theory. As behavioral psychology became more popular, the Albert study may have been misreported to better support behaviorism (p. 157).

It must be noted that Harris is only able to perform this analysis because Watson's published study contained a high level of objective detail. Watson concluded that Albert was afraid of the rat, but what Watson reported was Albert's actions and

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[*] Watson first tried an experiment involved simulating thunder and lightning; as this experiment was never published, it is assumed that it was unsuccessful (Samelson, 1980, p. 620). Watson also studied an infant's reaction to a candle flame, noting that it took about 150 trials for the child to learn not to reach for the candle (Samelson, 1980, p. 620; Cohen, 1979, p. 119).

behaviors (for example, that Albert fell over to his left side and then crawled away). It is thus possible to go back, nearly five decades later, and gain a deeper understanding of the experiment that would have been possible without such behavioral descriptions. The objectivity and detail which Watson valued enough to include in his original study is what supports Harris' paper, fifty years after the experiment was conducted.

Harris has a list of the scientific flaws of Watson's experiments with Albert:

> In addition to the study's reliance on only one subject, the experimental stimuli were insufficient to test for generalization effects, the observers' accounts were too subjective, and the technology did not exist to permit reliable assessment of emotional responses; there was insufficient follow-up and there was a confounding of instrumental and classical conditioning paradigms. (p. 158)

Franz Samelson's 1980 analysis of the Albert study found additional flaws. He notes with concern an often-neglected comment at the end of Watson's original article (Watson & Rayner, 1920). Under 'incidental observations,' Watson comments that

> During the course of these experiments, especially in the final test, it was noticed that whenever Albert was on the verge of tears or emotionally upset generally he would continually thrust his thumb into his mouth. The moment the hand reached the mouth he became impervious to the stimuli producing fear. Again and again while the motion pictures were being made at the end of the thirty-day rest period, we had to remove the thumb from his mouth before the conditioned response could be obtained. (p. 13)

For Samelson, "this procedure raises all kinds of questions about the experimental techniques used" (p. 621). Watson based his judgment about Albert's emotional state

on his behavior. Albert's primary action, however, was apparently to comfort himself to the extent that he no longer demonstrated any of the fear behaviors. This, combined with the use of a single subject, makes the study "an interesting but not very compelling pilot study" that did not provide any "hard scientific evidence" (p. 621).* The irony is

* It is worth discussing a particular piece of Samelson's evidence. He quotes a footnote from Watson and R. Watson's 1921 article "Studies in Infant Psychology."

> In fact, in a footnote to his 1921 article with R. R. Watson, Watson himself described "the work . . . [as] in such an incomplete state that verified conclusions are not possible . . . [it represents only] a preliminary exposition of possibilities" (p. 493) —a qualification he, too, soon forgot. (Samelson, 1980, p. 621)

Samelson neglects to point out that the footnote is attached to the title of the article, which discusses the general need for more research on infant development – especially the formation of standardized norms of development against which individuals can be compared – and Watson's conclusions regarding grasping, reaching, early eye movements, left and right handedness, and finally emotions. A summary of the Albert study occupies five of the twenty-four pages of the article.

The full footnote reads as follows:

> The work at Hopkins was left in such an incomplete state that verified conclusions are not possible; hence this summary, like so many other bits of psychological work, must be looked upon merely as a preliminary exposition of possibilities rather than as a catalogue of concrete usable results. (Watson & R. Watson, 1921, p. 493)

This disclaimer may very well be primarily aimed at Watson's preliminary work towards the creation of standardized norms of development, rather than the Little Albert study. In fact, when describing the work with Albert, Watson concludes that "this was as convincing a case of a completely conditioned fear response as could have been theoretically pictured" (p. 512). Hardly the doubt Samelson implies! Samelson is clearly very particular in selecting the evidence to support his interpretation.

that Watson – who was so concerned with the need for hard, objective science – based much of his psychology on this single study.

Watson was aware of the difficulty of being certain enough of a conclusion to generalize. In *Psychology from the Standpoint of a Behaviorist* (1919/1924), while discussing a hypothetical observational study of the reactions of an infant to various live animals, he states:

> Nor can we, from the behavior of this one child, draw any conclusions as to what other children of the same age will do, or what this child might do at a slightly different age or when tested under different conditions. Before generalizations can be made many children should be brought under systematic observation (p. 17).

In a serious of lectures in 1925, Watson again acknowledges the necessity of additional testing before a finding can be generalized. He is discussing the hypothetical study of emotional responses of three-year-olds: how first a sample would be gathered from diverse sources (both in terms of location and economic standing), and then the children would be brought into the laboratory where they would be exposed to various stimuli (snakes, fires, etc).

> But after testing him alone in all these situations we must test him again when an adult, possibly father or mother, is with him – when another children of his own age or sex is nearby, when another child of the opposite sex accompanies him, when groups of children are present. (1925b, p. 41)

Here Watson is acknowledging the complexity of emotional behavior. When Valentine (1930) attempted to replicate the Albert study, he would note the effect of many of these factors on children's fear responses. The Albert study did not include any of

these factors; quite probably because Watson was not concerned about Albert's general fear reactions, but rather in the process of conditioning fear. Since Watson was dismissed from Johns Hopkins shortly after the Albert study, it is unknown what other kinds of experimental work he may have wished to do. Still, it is vexing that Watson was aware of these kinds of confounds and yet failed to include them in his research, and the faith he placed in his single emotional conditioning study is increasingly puzzling.

Watson did have the opportunity, in 1924, to supervise some experiments regarding the removal of fear responses. He reported the findings in his subsequent 1925 lecture. Several methods were tried on various children without success (disuse, verbal organization, frequent application of stimulus, and social factors) (1925c, pp. 60-63). But a method of unconditioning, whereby the feared object was paired with a meal and gradually moved closer and closer to the child, was successful in at least one case (pp. 63-65). The child, Peter, was unconditioned to rabbits – and also to a number of similar feared things (cotton, fur coats, feathers, frogs, etc).

"The whole field of emotions, when thus experimentally approached, is a very thrilling one and one which opens up real vistas of practical application in the home and in the school – even in everyday life" (p. 65). Note how Watson is concerned with emotional conditioning primarily because of its practical applications. This fits with his conception of science as process of gaining control. Watson concludes this lecture with surprising caution, given his confidence in the Albert study:

> Incomplete and unsatisfactory as is this preliminary report upon the work of unconditioning, there are at present no further facts. We must leave the subject of conditioning and unconditioning of emotional

> reactions until we can work upon a larger number of infants and work with them under better conditions of control. (p. 66)

Little Albert and Watson's animal research

Watson's treatment of his work with Albert is especially interesting – and ironic – when compared with his earlier animal work. The Albert study produced "conclusive" (the original article, Watson & Rayner, 1920) and "convincing" (Watson & R. Watson, 1921) results. Watson did hesitate enough in the first article to add the disclaimer of "would seem to show conclusively," but by 1921 he had abandoned this hesitancy despite the general weakness of the study.

A 1913 article on the responses of rodents to monochromatic light is a more scientifically rigorous experiment, although Watson admits that the experiments "are far from being satisfactory" (Watson & M. I. Watson, p. 1). The first experiment used two animals, the second four. Several hundred trials were run. Food was associated with certain lights, as defined by their wavelengths, to determine by the animal's behavior which colors they could distinguish between. Watson was aware of three possible explanations for the animal's behavior (p. 3). It is clear from the article that Watson was conducting some of the first studies on this topic: "a few preliminary tests were taken with such astonishing results that we had completely to re-envisage the problem" (p. 4). Additional experiments followed. Watson's conclusions are very tentative: "the evidence seems to justify the conclusion" and "Experiment II offers good but not absolutely conclusive evidence" (p. 14).

Watson was also careful and cautious in his general handling of infant development. He paid attention to some of the smallest developments (blinking, for example). He often, in articles, lectures, and books, presented lists of the development of infant behavior (Watson & R. Watson, 1921, p 496 to 505; Watson, 1925a, p 17 to 32). These lists usually include some comments about what still remains unknown or areas for further experimentation (for example, 1925a, p 17). The Albert study seems to be the one exception to Watson's general caution regarding scientific conclusions. Perhaps the Albert study's importance to Watson's overall theory and possibilities for practical application encouraged this display of confidence.

Chapter 7

ON THE NATURE OF SCIENCE

Science as paradigms

The dictionary gives a definition for 'paradigm' as "an example serving as a model; pattern" (Random House Webster's college dictionary, 2001, p. 960). In 1962 Thomas Kuhn appropriated the word as part of his explanation of how scientific progress occurred. He neglected, however, to give a firm new definition of the word. A paradigm in the Kuhnian sense is a model, but closer to the concept of a worldview than the idea of a model usually suggests. A paradigm is how individuals, including scientists, understand and make sense of the world. The concept has become very popular: many scientists, including many psychologists, now think about their discipline in terms of paradigms. "Kuhn's theory about how science works was arguably a paradigm shift of its own, by changing the way that academics think about science. And scientists have been using the phrase ever since" (Marris, 2008, p. 1023).

A paradigm guides 'normal science,' which "is predicated on the assumption that the scientific community knows what the world is like" (Kuhn, 1962/1996, p. 5). It is the model of reality used to direct research, and when it is shared by the scientific community, it sets the standards for research.

Normal science is a search for the predicted and the expected; "its outcome can be anticipated, often in detail so great that what remains to be known is itself

uninteresting" (p. 36). The puzzle is in the how, the method for achieving the predicted result. The paradigm presumes the kind of answer expected, but more importantly it provides the assumption that a particular problem is solvable. The paradigm draws the lines between the kinds of problems which are valid and those which are inappropriate, on any grounds. It provides the "rules that limit both the nature of acceptable solutions and the steps by which they are to be obtained," the guidelines for what kinds of things exist or do not exist in the world (p. 38).

Kuhn developed his concept of paradigms to explain how scientific fields change over time. He noticed that, occasionally, normal science produces results which do not fit at all with the current paradigm. Often, only a minor adjustment of the paradigm is necessary to remove the discrepancy. Sometimes, however, the anomaly is persistent, and cannot be understood in terms of the current paradigm. What follows is a slow conversion of the scientific community to a new understanding of the world, into which both the anomaly *and* much previous research fit. Kuhn calls this a paradigm shift.

Kuhn makes a very explicit point about the notion of 'progress' in science. Over time, scientific theories improve in their ability to solve puzzles. Later scientific theories are not necessarily any closer to 'reality' than earlier theories. The models proposed by science may or may not have any similarity to what really exists (especially since there is no standard for knowing what really exists).

While Kuhn's paradigms are typically associated with the natural sciences – especially astronomy, given how well the Copernican Revolution fits Kuhn's theories – the social sciences were equally vital to the development of Kuhn's conception of

paradigms. While spending time in a community of social scientists at the Center for Advanced Studies in the Behavioral Sciences, Kuhn noticed the differences between social science and natural science communities. "I was struck by the number and extent of the overt disagreements between social scientists about the nature of legitimate scientific problems and methods" (p. x).

> The practice of astronomy, physics, chemistry, or biology normally fails to evoke the controversies over fundamentals that today often seem endemic among, say, psychologists or sociologists. Attempting to discover the source of that difference led me to recognize the role in scientific revolutions of what I have since called "paradigms." (p. x)

In Kuhn's view, a paradigm is necessary for science. Research cannot take place without it. A science cannot exist without a shared and accepted paradigm. The history of most sciences can be traced back to a pre-paradigm state, the time when the field was just emerging. "Though the field's practitioners were scientists, the net result of their activity was something less than science. Being able to take no common belief for granted, each writer ...felt forced to build his field anew from its foundations" (p. 13). At this stage, there are as many interpretations (or models) of the field as there are major scientists. Each has started from scratch, from their own observations and internal sense of what is important and what is not, and how things might be connected. Even when confronted with the same observations, different individuals draw different conclusions. "In the absence of a paradigm or some candidate for paradigm, all of the facts that could possibly pertain to the development of a given science are likely to seem equally relevant" (p. 15). The "acquisition of a paradigm and of the more

esoteric type of research it permits is a sign of maturity in the development of any given scientific field" (p. 11).

Psychology as paradigms

Awareness of the role paradigms play in the differences between psychology and the natural sciences can be traced back to William James. He viewed psychology's vague and ill-defined subject matter as ideal for the development of ideas and theories and notes that "at a certain stage in the development of every science a degree of vagueness is what best consists with fertility" (1890, p. 6). The early psychologists were each creating their own systems from the foundations up, with the predictable result of a great variety of theories, methodologies, and focuses.

John Watson was equally aware of the lack of consensus within psychology, although he took a negative view of it. In *Behaviorism* (1924/1930), he blamed the diversity on the introspective method and its subject matter. He explains:

> As a result of this major assumption that there is such a thing as consciousness and that we can analyze it by introspection, we find as many analyses as there are individual psychologists. There is no way of experimentally attacking and solving psychological problems and standardizing methods. (p. 5)

The solution to this problem is for behaviorism to be adopted as the dominant methodology in psychology.

In *Behavior* (1914), Watson acknowledges that psychology's youth as a scientific discipline was at least partially responsible for the variety of theories. "In most sciences which have existed for any length of time a general body of data becomes common property, and it is unnecessary to mention the original discoverers of the

universally accepted facts" (1914, p. v). Psychology is otherwise; "some parts of the study of behavior are so involved in controversy that no results can be said as yet to be universally accepted by specialists."

In 1928, Ralph Barton Perry incisively linked psychology's diversity with its yearning for scientific respectability:

> Perhaps the best proof that a branch of investigation has become a "science" is afforded by its ceasing to trouble itself about the matter. The doubtful sciences, such as history, economics, sociology, and ethics, are those which are most insistent on being "scientific." Psychology evidently still belongs to this list.
>
> The predicament which distinguishes psychology from its sister-sciences is a divided and conflicting program of research. The work of a science does not begin to become fruitful and cumulative, until there is an established technique and a body of generally accepted laws …. Psychologists are not even agreed on their problems, or on the kind of explanation which is to be regarded for the purpose of psychology as authentic and definitive. (p. 965)

Perry has defined psychology as a pre-paradigm science nearly thirty years before Thomas Kuhn would develop the terminology for it. Without a paradigm, psychologists cannot agree which problems are important, how to study them, and what kind of form the answers should take.

William James wrote in 1890, John Watson in the 1910s and 1920s, Perry in 1928, each noting the diversity within psychology. That diversity remains. Since Kuhn , there have been written "whole series of books on meta-psychology, exploring not what psychology is so much as what psychology ought to be…. There have been no magical reconciliations" (Cohen, 1977, p. 8).

> The latent metaphorical systems are different, the language is different, all the assumptions are different, and what counts as a decent piece of research is different. If you haven't got any of those criteria in common, you're not in the same subject and it seems to me you haven't got any one subject, you've got lots. (Hudson, 1997, p. 168)

Part of the problem may be due to the psychology of the psychologists, who, according to psychologist David McClelland, "love to argue. They hate to be wrong. Power contributes to science but it also makes people in science terribly argumentative" (1977, p. 37).

> There is, it seems to me, a tendency among psychologists to seek to polarise the subject so that if you adopt one view – let us say a behaviorist one – it follows that you argue, not that your approach is a valid approach to psychology, but that it is the only approach to psychology. Psychologists often try to claim that their ways of tackling the problems are the only legitimate methods and, however well-intentioned or clever what their ideological opponents are doing, it is clearly not psychology.
>
> Psychologists seem to be constantly embroiled in disputes that are aimed at defining what psychology is about. (Cohen, 1977, p. 13)

The "Cognitive Revolution"

Behaviorism remained an active part of American psychology until around the 1950s. Watson's 'classical' behaviorism was adopted and further developed by other psychologists, most notably B. F. Skinner. Skinner extended Watson's concept of behaviorism and created something new ('radical' behaviorism) (Todd & Morris, 1994, p. xxi). But by the 1950s and 1960s, behaviorism was losing its appeal: "experimental psychologists, in increasing numbers, believed that they could not explain human behavior by continuing to ignore mental processes" (Benjamin, 2007, p. 197).

The shift away from behaviorism and back to the mind shows similarities with the initial shift away from the mind. The definition of psychology was changed. Conceptions of what experimental methods were valid, and what topics were appropriate or necessary to study, changed. The mind had never disappeared completely from psychology; behaviorism may have dominated American psychology, but German psychologists continued to explore mental states.

There are two factors behind behaviorism's loss of appeal to the researching psychologist. First is the failure of the behaviorist theory to explain human behavior, as discussed above. Second is the failure of behaviorist theory to provide interesting research questions. Psychologists

> simply found the ideas being entertained under the cognitive umbrella much more interesting than those they entertained under the behavioral umbrella .... This analysis of the cognitive revolution suggests that the revolution was based not so much on competition between anomalous facts and competing theories, but rather on the fact that many researchers and theorists simply became bored with the constraints imposed by behaviorist views. (Royer, 2005, p. 3)

The return to the study of the mind as a legitimate scientific topic was aided by the creation of a new tool for modeling mental systems. In addition to introspective observations, the new cognitive scientists could use computers to test out their hypothesized models. These psychologists were still concerned with issues of scientific validity; George Miller explains that "cognitive processes surely exist, so it can hardly be unscientific to study them" (qtd. in Benjamin, 2007, p. 214).

Despite the popular name "the cognitive revolution," this shift was no more a revolution – but also no less – than the emergence of behaviorism. A pre-paradigm science cannot have a scientific revolution in the traditional definition of the term. The shift from behaviorism to cognitive science was not the replacement of one paradigm with another, but a change in dominance among a number of psychological paradigms. Liam Hudson, quoted above on the diversity of psychological theories implying the existence of many psychologies, was writing in 1977, well after the cognitive revolution had taken hold. The diversity remains.

John Watson's contributions

How was the cognitive revolution, and the future of psychology in general, influenced by that which came before? Or, to ask the question a different way: what was the influence of behaviorism, and how did John Watson contribute to psychology?

Behaviorism influenced American psychology; that much is undeniable. One history of behavioral psychology opens with "Historians agree that behaviorism was the dominant force in the creation of modern American psychology" (Mills, 1998, p. 1). Whether this influence was beneficial or harmful to psychology is less clear. Mills further argues that even judging the influence of behaviorism is difficult to understand, because behaviorist ideas form a large part of most American psychologists' concept of their discipline. "Its dominance in American psychology blocks our efforts to understand its role and its nature" (p. 1). Watson has been accused of "prevent[ing] a psychology of the human from being established," and

behaviorism of preventing developments in memory and thought (Mandler, 2007, p. 103). The opposing argument is that

> psychology's progress as a science in the twentieth century was principally because of Watson, that he was the one figure who demanded a complete break with philosophy .... And likely, cognitive psychology is a stronger scientific field because it adopted many of the tenants of behaviorism in establishing its science. (Benjamin, 2007, p. 153)

It will never be known whether Watson's influence was due to him as an individual – his vision of psychology combined with his personality, popular articles, and the specific events of his professional life – or whether the discipline was ready for a shift away from introspection and Watson appeared at the right time and place. Watson's prolific writing was a factor, especially his popular articles written for a lay audience and stressing the practical applications of behavioral psychology. This emphasis, combined with his popularizing, "helped broaden the scope and acceptance of psychology beyond what would have been possible had Watson not been one of its most effective advocates" (Todd, 1994, p. 90).

The value of Watson's contributions to psychology have changed over time.

> It is something of a paradox that in the 1950s Bergmann and Skinner placed Watson in the same league as Darwin and Freud, whereas some psychologists today regard Watson as an embarrassment and as having done harm to the field. (Horowitz, 1992, p. 363)

Yet while behaviorism has fallen from dominance, the results of Watson's efforts to establish psychology as a valid, objective science remain. Some aspects of Watson's

methodology have become "cornerstones" in psychology (Horowitz, 1992, p. 363). "Definitional standards for stimuli and responses and criteria for making objective and reliable observations can be traced back to Watson and continue to characterize acceptable investigatory practices today."

Behaviorism was more than just a focus on observable behavior and a shying away from consciousness. "What so many intellectuals resonated to [in behaviorism] was not the details or the program so much as the ideal of scientific objectivity" (Burnham, 1994, p. 72). There is "widespread agreement" that Watson's efforts were "critical" to psychology's adoption of more objective methodologies and "in establishing it as a science" (Logue, 1994, p. 115). Watson, "more than anyone, can be credited with promoting the idea that psychology, or at least behavior analysis, can be a natural science" (Baum, 1994, p. 135). Behaviorism itself had a strong impact, but so did the idea of being scientific.

> What exactly was it that Watson did and stood for? Did he usher in the objective natural science of psychology? Did he send the discipline on a costly and time-consuming detour that eventually required a second, cognitive revolution? Or did he herald the brave new world of mind and behavior control? There are many views of Watson's role we can choose from. (Samelson, 1994, p. 4)

The philosophy of science

Psychology has always been striving for the recognition of being a science. John Watson in particular pushed forward his brand of psychology on the grounds that prior methodologies had failed to achieve this recognition. But while Watson claimed

to be scientific, and some understanding of what he meant by this can be gleaned from his writings, he does not come out and state exactly what qualities psychology must achieve before it will become a science. Why is this, and what else has been written about the nature of science?*

A large part of the problem is that there is a general lack of consensus on exactly what a science is. Let us briefly foray into a discussion of philosophy, for there is an entire branch of that discipline dedicated to figuring out what science is. Since these philosophers attempt to get at the 'essential nature' (if it exists) of science, it is worth a short discussion of some of the important issues within their discipline. What must be first understood about the philosophy of science is that it is first and foremost a *philosophy*. It should also be noted that "there is a long tradition of philosophers trying to tell scientists what is and isn't possible, and later scientific developments have often proved the philosophers wrong" (Okasha, 2002, p. 55).

The problems which puzzle the philosophers can often be completely ignored by the practicing scientist. Philosophers have a tendency to be preoccupied with truth, in the sense of an absolute, final, known-without-a-doubt Truth. Science generally has little to do with this kind of Truth-with-a-capital-T. There have been enough scientific revolutions – in which the scientific explanation of how the world worked was completely revised and replaced with something wholly different – that

* Well, entire bookcases worth of books, for one thing. This chapter will only discuss a few points which seem particularly relevant to psychology's quest for scientific recognition.

science is no longer explicitly concerned with the search for truth. It is the search for a theory which offers what seems to be a good explanation for the way the world works, but which cannot ever be proved as true. Since Newton, explains Bronowski, "the world has fallen about our ears. There is almost no scientific theory which was held to be fundamental in 1867 which is thought to be true in that form today" (1978b, p. 56). He continues,

> we have spoken enough about truth to know that we are not going to get a final picture of the world. Nobody is going to find the truth one fine day, as I say, like a hat or an umbrella. (p. 122)

When the Nobel Prize-winning geneticist François Jacob discusses the concept of truth, it is in the sense of personal integrity.

> Scientists owe it to themselves to tell the truth. But it must be the whole truth and nothing but the truth….They must explain to their contemporaries what they are doing, what stage their science is at, what is new, what can be expected …" (Jacob, 1997/1998, p. 122)

Philosopher of science Karl Popper proposed that a key aspect of science is its falsifiability: it must be possible to disprove a scientific theory. John Watson would agree; the debate over imageless thought (and the inability of either lab to convince the other) was one of his major objections to the introspective methodology. Unfortunately for Popper, when most scientists encounter an observation that does not fit their theory, they attempt to find some way to accommodate that observation within the theory, rather than declaring the theory unfit and moving on. This effort to

accommodate has even led to important discoveries*. Change in science has been discussed by Thomas Kuhn, who proposes that there is an element of irrationality to the process. Data is not objective or neutral; it is defined by the theory. It is beliefs which shape perceptions, and observations are described in terms of theoretical concepts (Okasha, 2002, pp. 87-88). During a period of scientific revolution, when scientists must choose between competing theories, there are no objective, rational rules which the scientists can use to make their decisions – instead, there is a subjective component (p. 92).

Scientists are usually content once they have demonstrated that their experiment is reproducible. There is always the risk that any experimental outcome was the result of chance, or that uncontrolled (and usually unnoticed) factors determined the outcome. This is especially the case with psychology. There are many factors which influence an individual's behavior, ranging from the time of day to the local environment to what happened last night. It is only when approximately the same result is obtained over varying conditions and locations can the scientist be confident that it is in fact the controlled and manipulated variables which are determining the outcome.

The philosopher asks, "*why* assume that future repetitions of the experiment will yield the same result? How do we know this is true?" (Okasha, 2002, p. 12). This is a question of whether something is true or not in a provable sense;

* For example, it was observed that Uranus' orbit was not as predicted from Newton's theories. Rather than abandoning Newton's theory, the astronomers proposed that another planet existed. The mass of this planet would explain the discrepancies in Uranus' orbit. Shortly thereafter, Neptune was discovered.

therefore, it is a philosophical and not a scientific question. David Hume in particular worried over this, and concluded there was no rational reason to believe inductive reasoning (p. 24). Inductive reasoning is the process of generalization, of extending the conclusions about objects which have been observed to objects which have not been observed. It is vital to science; it is impossible to gather a sample which includes every instance of the object (human, fish, electron, etc.) being studied. Instead, a smaller (and hopefully representative[*]) sample is collected, studied, and then the conclusions are generalized to the population as a whole. However, there is no rational explanation for why the unexamined objects will be similar to the examined objects. Science is based on inductive reasoning, and philosophers have shown that there is no rational justification for inductive reasoning. Philosophers have then spent great amounts of effort and time attempting to determine why inductive reasoning can be trusted (pp. 27-39).

Science is often a method for explaining the phenomena of the world. Philosophers thus attempt to determine the rules for what is or is not a scientific explanation. Some scientific explanations are also scientific predictions: given general rules and specific facts, the observed phenomenon *had* to occur[†]. Causality is often an important part of a scientific explanation, but causality is difficult because it cannot be

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[*]When scientists argue over generalization, the problem is usually how representative the sample is of the larger population.

[†] A clear example from Okasha's *Philosophy of Science* (2002, p. 42) is the explanation of the death of a house plant in a windowless room. Given that plants need sunlight for photosynthesis and that photosynthesis is necessary for plant life, a plant which does not receive sunlight will die. The explanation is also a prediction.

directly observed. Scientists must be careful in claiming causal relationships; experimental (rather than observational or correlational) evidence is required. After much discussion, "many philosophers have come to the conclusion that the concept of causality, although philosophically problematic, is indispensable to how we understand the world" (p. 51).

Philosophers are also bothered by the distinction between observable and unobservable (but detectable) aspects of the world. The observable can be "directly perceived by human beings" without the use of instruments (Okasha, 2002, p. 59). The unobservable cannot be directly perceived, although what is unobservable may be detectable by the use of instruments (atomic particles are a prime example). The philosophy of anti-realism (or instrumentalism) holds that it is impossible to prove, for example, that atoms (which cannot be directly observed) exist. Even the existence of technology which seems to require the existence of atoms to function is insufficient to prove to an anti-realist that atoms exist. The history of science is littered with theories which seemed to fit the empirical evidence but were eventually disproven (for example, the phlogiston theory of combustion; p. 63). This entire argument can be resolved by acknowledging that the concept of *proof* does not belong in a discussion about science[*]. Scientific theories are not and can never be proven. They can be supported

[*] One part of this philosophical debate involves the concept of underdetermination: the fact that any particular observation could conceivably be explained by a number of different theories. However, even writers of books of the philosophy of science admit that the history of science "lends support to the realist view that underdetermination is merely a philosopher's worry, with little relation to actual scientific practice" (Okasha, 2002, p. 73).

by the available evidence, and they can be disproven. This is the case whether the theory concerns observable phenomena (such as fossils) or unobservable (such as atoms).

Philosophers of science do agree that it is the methodologies – observation, experimentation, and theory-construction which make a field scientific (p. 2). It is not the content or even the end goal of understanding, explaining and predicting the world since non-sciences (like religion) share that goal (p. 1).

There is then no philosophically-based definition of what makes a science a science, beyond an acknowledgement that it is the methodologies, and not the field of study, which makes a science. There are no official requirements that a field must achieve to become a science. It is as if 'science' is simply a human-created category with fuzzy edges. There are enough similarities in methodology between different disciplines that it is reasonable to group them together as sciences. This is an important categorization because science has a history of being very effective, and so a certain amount of trust is placed in the conclusions of scientific fields.

William Clifford: Scientific thought is the guide of action

On August 19, 1872, the philosopher and mathematician William Clifford spoke "On the aims and instruments of scientific thought" (Clifford, 1879, p. 124). He understood the philosophical concerns regarding the nature of science, but he also understood how science was not concerned with proving the Truth. According to Clifford, scientific thought is the process by which humans can apply past experience to

new, different circumstances (p. 128). This requires, as the instrument, the assumption that past experience is relevant to current circumstances – the assumption of the uniformity of nature which so preoccupied David Hume. Clifford discusses the question of whether "the uniformity of Nature [is] absolutely exact, or only more exact than our experiments?" (p. 134), and concludes that "a law is practically universal which is more exact than experiment for all cases that might be got at by such experiments as we can make. We assume this kind of universality, and we find that it pays us to assume it" (p. 138). While it is impossible to know the uniformity of nature with absolute certainty, Clifford is content to acknowledge that to assume this uniformity is almost always useful.

It is worth noting how Clifford defines the concept of 'explanation' (a concept which also preoccupies philosophers, although Okasha's summary of the philosophy of science did not mention Clifford's definition).

> The explanation describes the unknown and unfamiliar as being made up of the known and the familiar; and this, it seems to me, is the true meaning of explanation (p. 147)…. And this brings me to consider the source of the pleasure we derive from an explanation. By known and familiar I mean that which we know how to deal with, either by action in the ordinary sense, or by active thought. When therefore that which we do not know how to deal with is described as made up of things that we do know how to deal with, we have that sense of increased power which is the basis of all higher pleasures. (p. 148)

It is Clifford's conclusion which is of the greatest value here.

> Remember, then, that [scientific thought] is the guide of action; that the truth which it arrives at is not that which we can ideally contemplate without error, but that which we may act upon without fear; and you cannot fail to see that scientific thought is not an accompaniment or condition of human progress, but human progress itself. (p. 157)

Scientific thought – as defined as "the application of past experiences to new circumstances by means of an observed order of events" (p. 155) – includes not only physics, mathematics, biology, and astronomy but also poetry, government, and morality (p. 156). The goal of scientific thought is not Truth. The goal is knowledge which can be acted upon.

Chapter 8

THE NEED FOR RECOGNITION

A question remains. In his Behaviorist Manifesto, John Watson stated that psychology "has failed signally, I believe, during the fifty-odd years of its existence as an experimental discipline to make its place in the world as an undisputed natural science" (1913b, p. 163). The reason was its methods: introspection was an unscientific method which prevented psychology from achieving recognition as an "undisputed natural science." But the problem, according to Watson, was not just that psychology was unscientific, with flawed, subjective methods. The problem was that psychology had not achieved "its place in the world as an undisputed natural science." Watson wanted more than a scientific psychology: he wanted psychology to achieve *recognition* as a science – although he never specifies who should be granting that respect.

Watson was not alone in these thoughts. Even those psychologists who could not answer his call to abandon consciousness entirely "could support his efforts to bring psychology into the scientific mainstream" (Buckley, 1989, p. 86). "He was hailed by the younger members of the profession as a 'second Moses' … because he promised to lead the way out of the wilderness" (p. 86). Watson's most significant contribution to psychology may very well have been his efforts to establish the discipline as an objective, natural science – which could not have happened without

widespread agreement. Ralph Barton Perry commented on psychology's quest for scientific recognition in 1928, and studies were done on the status of psychology (Ruckmich, 1912).

This yearning was not present in William James' writings in the 1890s. He saw the vague, ill-defined nature of psychological research as a necessary and "fertile" time in the discipline's history (1890, p. 6). But something had changed between the time of James' first writings on psychology and Watson's Behaviorist Manifesto. Somehow, it was not enough to be a science. A field had to be *recognized* as a science. But why did it matter so much what the world thinks? Whose respect and recognition was necessary?

Mundane details: funding, laboratories, academic departments

It may be inferred that one of the motivations for achieving scientific respectability is a purely practical one: acquiring and maintaining separate departments at universities, laboratory space, and funding. Watson himself complained of a lack of professional status (Buckley, 1989, p. 85). Christian Ruckmich's 1912 article on the status of psychology implies that psychologists of the time were concerned about holding separate departments and laboratory space. His first statistic concerns the number of universities with a psychology department. In several cases psychology was still classified with philosophy, with about half of the joint departments reporting unsatisfactory conditions (p. 522). Ruckmich directly states that "it must be conceded by the philosophers that the method of approach of their discipline and sub-disciplines

is not of the same empirical nature as is that of the psychological laboratory" (p. 523). Being grouped with philosophy was harmful to psychology.

The next criterion of interest to Ruckmich was "to compare, if possible, the standing of psychology as an academic discipline with that of several other disciplines," including physics (p. 524). It is not enough to merely comment on the number of independent psychological departments; that number must be compared with other disciplines – as if there is a race between the disciplines to acquire the most professors, students, and funding. These criteria give the impression of a young discipline struggling not only to expand but also continue its existence. Laboratories are expensive endeavors, and Ruckmich identifies introspection by name as a possible contributor to psychology's slow progress (p. 531). While psychology was a growing field, it was still ranked low on the given criteria.

These mundane reasons of laboratory space and separate academic departments, while certainly important, do not seem enough on their own to explain Watson's drive for scientific recognition.

The popular opinion

Watson was a prolific writer, producing many articles not just for academic journals but for the popular press as well. Around the time of his Behaviorist Manifesto, Watson wrote for *Harper's* because he needed the extra income. He defended his popular articles in a letter to Yerkes, saying that he was "just about to perish to death!" (qtd. in Buckley, 1989, p. 86). After his dismissal from Johns

Hopkins in 1920, Watson's publications were limited to the popular press. He was somewhat bitter about being restricted to lay audiences:

> I received pay for them – generous pay….since there was no longer opportunity for me to publish in technical journals, I saw no reason why I should not go public with my wares. Yet these articles have brought criticism greater than the offense. (Watson, qtd. in Cohen, 1979, p. 256)

Watson's popular articles – especially those written after his dismissal – included many aspects of behaviorism "that seemed to have little to do with data and much to do with his own viewpoints" (Logue, 1994, p. 117). Much of the criticism directed against Watson's behaviorism was aimed at the version of behaviorism presented in popular, rather than academic, writings (p. 120). Watson was motivated to write "provocative articles" filled with "attention-grabbing rhetoric" to maintain his popular audience – which gave him both extra income and the public status as a famous scientist he needed while working for the J. Walter Thompson advertising firm (Logue, 1994, p. 117; Todd & Morris, 1994, p. xxiv).

Certainly mundane factors such as income and public status were factors encouraging Watson to write an abundance of articles and books aimed at a lay audience. And Watson's popular articles contributed to the success of behaviorism; it has been proposed that "Watson forced psychology to take his views seriously because nonpsychologists in the public and academia did" (Todd & Morris, 1994, p. xxiv).

Watson wrote popular articles at a time when most scientists did not do so. "Science was seen as much less of a public domain" in 1930; it was not until 1934 that the position of 'science correspondent' was created in the newspapers (Cohen, 1979, p. 256). "We owe to Watson the popularization of classical behaviorism that enlisted

wide public interest in behaviorism as a 'new' psychology to displace the older 'introspective' psychology" (Hilgard, 1994, p. xvi). To the extent that Watson's popular articles contributed to the growth of behaviorism over introspection, and given Watson's concern with making psychology an objective, natural science which was recognized as such, could the two be related? He never specified who was to award psychology "its place in the world as an undisputed natural science" (1913b, p. 163). Perhaps Watson regarded public opinion as a factor in psychology's scientific respectability.

The view has its attractions. Watson made an effort to inform the public of psychology – or at least of behaviorism, and while he received substantial funds for doing so, David Cohen argues that Watson had other reasons:

> Watson always felt the public had a right to know what psychologists were doing and thinking …. He also used these magazine pieces to communicate what behaviorism was really about as a theory and what its implications for the ordinary man or woman were…. [he tried] to make the public see the benefits of behaviorism. Partly, of course, he wanted to prove that he was right, but partly too, he believed that people should be able to make use of psychological knowledge to improve their lives. (Cohen, 1979, p. 248)

Many of his popular articles focused on the practical benefits of behaviorism, and all "were widely read" (p. 248).

Practical applications of psychology: a means to gain respectability?

Watson repeatedly stressed the practical applications of his behavioral psychology in both his academic and popular writings. Behaviorism had the power to "aid organized society" by determining the laws which govern human behavior

(Watson, 1917, p. 329). The knowledge of these laws would allow environments to be chosen to fit an individual, or "the individual may be moulded (forced to put on new habits) to fit the environment."

The Behaviorist Manifesto had the appeal of practicality: "The temper of the times was to be practical. All kinds of reforms were in the air. Watson's manifesto offered the possibility of a psychology that would be practical as well as scientific" (Cohen, 1979, p. 79). He saw control as a key aspect of science; "every scientist feels that he makes progress in his field just to the extent to which he can gain control over the material with which he works" (Watson, 1919/1924, p. 7). It was therefore important for psychology to demonstrate its practical applications.

When Watson proposed the method of conditioned reflexes to replace introspection, he focused on one particular method which had "an immediate and widespread usefulness" (1916, p. 94). In 1917 (and in 1919, with nearly identical wording), he insisted that "the results of psychological experimentation are as immediately practicable as results in any other scientific field" (1917, p. 345; 1919/1924, p. 17). Practical applications are a natural extension of Watson's focus on prediction and control, rather than understanding or explaining, as the goals of a natural science such as psychology.

After his resignation from Johns Hopkins in late 1920, Watson joined the J. Walter Thompson advertising company and found another opportunity to apply behavior psychology. He substituted the marketplace for the laboratory and studied the consumer (Buckley, 1989, p. 137). "Watson continually sought to legitimize the authority of psychologists by emphasizing the application of their expertise to problems

encountered in everyday life" (p. 168) – yet "most of his conclusions seem to have been drawn [not from experimental evidence, but] from his belief that the future of society demanded the control he was seeking over human behavior" (p. 170).

World-designing experts

Watson's emphasis on practical applications, when fully extended, may provide the reason why it was so important for psychology "to make its place in the world as an undisputed natural science" (Watson, 1913b, p. 163). American society was undergoing radical changes in the 1910s and 1920s; the human world was being reshaped and re*designed*. If psychologists were going to be among the experts redesigning the world, the discipline was going to require significant respect.

Watson's 1919 book on behaviorism, *Psychology from the Standpoint of a Behaviorist*, begins with Watson's usual discussion on the need for a new, scientific psychology. After covering the basic failings of introspection and the objective nature of behaviorism, Watson mentions some of the kinds of problems psychology is seeking answers to:

> *Given the situation, to Predict the Probable Response* – … Socially we meet many practical problems in this aspect of behavior psychology. Russia has a Soviet form of government following immediately upon hundreds of years of monarchical government of an autocratic kind. What changes in behavior will this situation bring in the lives of individuals in Russia? Again in this country a new situation has been set up by the enactment of the Eighteenth Amendment. Before establishing this situation we should have been able to predict the changes such an amendment would bring. (pp. 6-7)

And in a footnote attached to the end of the just-quoted paragraph:

> When far-reaching social situations are set up, is an expert in human behavior called in? No city or corporation would build a dam across a sizable stream now without consulting experts on agriculture, forestry, etc. to predict what the probable effect will be upon the soil and vegetation on the country above the dam. But here loss of money can be avoided, lawsuits can be saved. If social blunders are made only human sacrifice and unhappiness are involved. (p. 7)

If psychology was to become publically recognized as a science, would psychologists be called in as the experts in social situations? Psychology concerns itself with predicting the response of people to various life situations, the kind of predictions that everyday people have to make every day.

> But until psychology becomes a science and has amassed data on behavior resulting from situations experimentally set up, prediction of behavior resulting from daily life situations will have to be of the hit or miss kind that it has been since the race of man began. (p. 7)

Psychology as a science has much to offer "the man on the street;" it is the role of scientists who have gathered data from experiments to offer guidance to everyone else (p. 7). Note the emphasis on psychology's need to become a science and how data must be gathered from experiments. Mere observation is not sufficient. It is a simple assumption from this point to believe that only properly trained scientists, basing their judgments on well-controlled experiments, are qualified to make accurate predictions. Without the science, only "hit or miss" predictions can be made.

> Until we know more about the control of behavior during the tender years of infancy, it seems almost a dangerous experiment to bring up a child. The old argument that a good many millions of children have been successful reared in the past few millions of years has just about broken down in the light of the generally recognized lack of success of most people in making satisfactory adjustments to society. (p. 8)

Thus the necessity of experimental laboratories, so that human development be properly studied – and then properly controlled.

> The behaviorist believes that only systematic, long-sustained, genetic studies upon the human species begun in infancy and continued past adolescence, will ever give us this experimental control over human conduct so badly needed both for general social control and growth and for individual happiness….Every human individual needs the data and laws of behaviorism for organizing his own daily life and conduct. (pp. 8-9)

By stressing the practical nature of behaviorism, Watson shows how psychology can impact the life of "every human individual." Science is almost necessary for "every human individual" and for society as a whole. Without science, society moves "on a blundering trial-and-error basis" (p. 9). It is through science that society can be brought under control and adequately guided.

It is therefore imperative that psychology establish itself as a science.

These statements imply that John Watson saw science as the cure for the upheaval and change present in society. If society was going to change, then it ought to do so under the direction of an expert who could offer accurate predictions for the results of any particular societal change. Behaviorism called for a "faith in the scientific method to usher in a new era of progress" and "held out the possibility of new professional roles for psychologists themselves" (Buckley, 1989, p. 184).

This was the 1910s and 1920s, when modernity was arriving in American culture and challenging traditionally held values and worldviews. Watson was writing in the midst of a paradigm shift in American society, and one aspect of the new

worldview was the increased value placed on science. "Watson tirelessly campaigned for a brave new behavioristic world where faith in science and scientific expertise would replace traditional guides for human conduct" (Buckley, 1994, p. 36).

Increasing importance was also given to the expert. Some elements of progressivism valued efficiency and experts (Dumenil, 1995, p. 18). The idea of "scientific management" gained popularity in factories and offices and advocated that "decision making, planning, and implementation be removed from foremen and workers and shifted to professional engineers …. Management then gave workers explicit instructions as to method and speed" (p. 60). The 1920s saw a growing effort on the part of management to shape their employees' habits and values (p. 69). The overall theme was that only specially trained experts were qualified to make decisions, and everyone else required their guidance.

This attitude was aided by developments in the epitome of natural science, physics. Efforts to explain Einstein's theory of relativity to the general public, while not necessarily adequately explaining relativity, "did convey the notion that commonsense knowledge and ordinary experience were no longer adequate to understand the physical world" (p. 147). A philosopher noted that "the recent development of science, involving even greater mastery of complicated technique, means in effect a return to an artificial barrier between the uninitiated layman and the initiated expert" (Morris Cohen, qtd. in Dumenil, 1995, p. 147).

The actions of psychologists during the first World War support this position. A number of psychologists (and other progressives) saw the emerging war as a chance to reshape American society. Wars depended on people; psychologists were

qualified to "provide scientific methods of personnel selection and training" (Buckley, 1989, p. 100). Psychologists were also strongly motivated to gain increased recognition and respect for their profession; the only disagreement was over the best path to take. Some, including Yerkes, valued positions on national decision-making committees (p. 102); others preferred to display the results of applied psychology. Yerkes and Watson had had frequent communication over the years; Watson often wrote to Yerkes explaining his efforts to develop a behavioral psychology. Both were involved in the effort to aid the army and advance psychology by heading various committees.

After the war, Watson became involved with projects clearly inspired by the application of psychology to the war effort: the study (and improvement of) inefficient employees at John Hopkins; general personnel selection and management; and investigating the effects of educational films on the general public. "What were formerly moral issues regarding public obligations in the marketplace or private choices of conscience were now considered to be scientific questions to be determined by impartial observation and experimentation" (Buckley, 1989, p. 114). Businesses and psychologists were beginning to realize what each could offer the other. Psychologists were trained and qualified to help with advertising, personnel selection, and other aspects of businesses; said businesses possessed funding which the psychologists could use to support their research.

In his popular articles, Watson emphasized application, becoming an "advocate of psychological engineering as an agent of social control and as a means of

adjustment for those who had difficulty adapting to the new social order envisioned by an emerging class of social planners and corporate managers" (Buckley, 1994, pp. 35-36). Watson wrote a series of articles for *McCall's* on child-raising, describing parenthood as "a science, the details of which must be worked out by patient laboratory methods" (1927, p. 44). Stressing the role of the environment – and the parents – Watson presents behaviorism as the source of knowledge for how to raise a child.

This concept of the psychological scientist as expert can still be found. "It has often been said that psychologists and psychoanalysts, especially, have become the priests of a godless age" (Cohen, 1977, p. 1).

> Psychologists have infiltrated widely. The psychologist is no mere doer of experiments; he, or she, is no mere purveyor of theories. He advises. He consults. As an advisor, he wields much influence, and sometimes, power. He can go into industry, into personnel work, into clinical work, into education and into civil service. (p. 2)

One psychologist, David McClelland, proposes that psychologists have a high need for power, and "to know how people work is a supreme expression of power" (p 25).

Chapter 9

CONCLUSION

John Watson had plans for psychology: he envisioned the discipline gaining the mantle of scientific respectability, and he saw the possibilities for the prediction and control of behavior. This thesis has discussed in depth the key features Watson thought necessary for a respected, scientific discipline. To be a science requires that results be reproducible across laboratories. Terms need to have precise, standardized definitions. Objectivity, accuracy, and precision are important, and often best achieved through the use of apparatus. Conclusions are based on experimental evidence, gathered under specific and controlled situations. The end goal is to predict and to control, and scientific results have practical applications.

Watson was motivated by his distaste for introspection and the limitations it imposed on psychology, but he was also motivated by the possibilities of a behavior-based psychology with a focus on control. Watson's emphasis on the practical applications and benefits of behaviorism also ensured popular support for his psychology. He imagined a radically altered society under the guidance of behaviorists, replacing the old traditions with ones based on the sciences. He questioned the continued existence of marriage and family-raised children.

Watson's behaviorist utopia depended on science – which meant that it depended on psychology gaining the scientific respectability necessary for psychologists

to be acknowledged as experts. This is not to imply that Watson secretly planned for psychology to gain scientific status in order to create his vision of the perfect world. But his demands for an objective science could easily be related to the practical possibilities he saw for behaviorism. Science, to Watson, meant control, but it also meant the respect which would allow that control to be applied.

This understanding of John Watson's science was placed in historical and philosophical context. A brief history of astronomy allowed psychology's progress to be compared to that of one of the older, more traditional sciences which Watson wished to emulate. An analysis of William James' writings, among the first in psychology in America, allowed for Watson's ideas to be placed in a more immediate context. There was brief foray into the philosophy of science, with a focus on Thomas Kuhn's paradigms and some comments on the ideas of William Clifford.

This was a case study approach, using John Watson as a focal point and expanding around that point to create context, to the exploration of the concept of science.

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