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Figureheads of Psychology: Intergenerational Relations in Paradigm-breaking Families

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A social historical view of science suggests that much can be learned about the evolution of science by studying the transmission of knowledge across generations which play different roles in the paradigm shift. The life histories of paradigm breakers like Wundt and Freud reveal generational differences in the approach to psychology. This is due in part to the different tasks within the paradigm faced by the paradigm-breaking generation and by the succeeding generation of scientists. It is suggested that these generational differences in paradigmatic tasks affect interpretations of ideas and the evolution of scientific knowledge as well.

Occasions arise on which it is *avant garde* to call up the scientific dead so that they may be soundly criticized for their failure to foresee all the consequences of their contributions to knowledge. Such a disciplinary seance has as its goal the humiliation of the dead in light of current scientific awareness. But the ghosts are often humble before they become ghosts: Marx is said to have denied on his deathbed that he was a Marxist; one can easily conjure up Einstein grieving, "I gave you a simple formula — look what you've done with it!" This paper will deal with the basis of our knowledge of ghosts and with the discrepancy between our own parapsychology and history. "Men become attached to particular sciences and speculations either because they fancy themselves the authors and inventors thereof, or because they have bestowed the greatest pains upon them and become most habituated to them." So said Francis Bacon (in Commins and Linscott, 1954, p. 94) and his words have echoed now for four centuries. The history of science demonstrates that science itself is not entirely logical; rather, the history of science is composed of the same stuff of which all histories are composed — events which occur in a context. The context of scientific development has been the focus of sociologists interested in the scientific community and of historians, who provide an analysis of the temporal context of scientific change. These perspectives — the history of science and the sociology of knowledge — provide a framework for unearthing the ghostly past.

According to Thomas Kuhn (1962), science develops through two stages — normal science and extraordinary science. The history of science is the history of succeeding paradigms and of the changes in those paradigms brought about by the work of scientists. This history is not cumulative, but is rewritten in each paradigm. The sociologist Karl Mannheim agrees. We

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measure change in knowledge, he says, not in lifetimes, but in generations. What appears to be the "inner dialectic" of ideas is really a reflection of the intergenerational transmission of knowledge. The two perspectives lay a groundwork for the study of the development of contemporary views of the history of psychology. The scientific histories of paradigm breakers — Wilhelm Wundt and Sigmund Freud are examples — demonstrate the usefulness of the perspectives of Kuhn and Mannheim in tracing the development of science. Both Wundt and Freud were responsible for an observable change in the evolution of psychological paradigms and each had a marked and recorded influence on the next generation of psychologists. These scientific histories reveal that our current views of past scientific developments are influenced not only by the ideas generated by scientists, but also by the role of the scientist in the paradigm and by the transmission of ideas to the next generation of scientists.

Traditions of a Social Historical Science

On the ledger which records the era of scientific history from the 16th to the 17th century, the name of Francis Bacon stands out. Bacon asserted that the mind, when freed from prejudice and generalization, could gain sovereignty over nature through unencumbered knowledge:

> For I am of the opinion that if men had ready at hand a just history of nature and experience, and labored diligently thereon; and if they could bind themselves to two rules, — the first, to lay aside received opinions and notions; and the second, to refrain the mind for a time from the highest generalizations, and those next to them, — they would be able by the native and genuine force of the mind, without any other art, to fall into my form of interpretation. (Bacon, in Commins and Linscott, 1954, p. 158)

Bacon was clearly under the impression that the truth in nature was there for the taking; that scientists of his day had not yet found it was because truth could not enter a mind shut off by idols and false notions. Bacon described four of these idols. The source of the first, the idols of the tribe, lay in the foundation of human nature and the human race. All perceptions were measures, not of nature, but of the individual, whose relation to the human race distorted the light of nature like reflections from a distorted mirror. The light of nature was also distorted by the cave of individual learning and experience — the second idol, the idols of the cave. These false lights of nature, and not true nature itself, were the subject of social intercourse, the idols of the marketplace. Finally, the idols of the theater were imparted into the minds of scientists through the dogmas of philosophy and the false demonstrations of nature.

By founding ideas and their axioms on true induction and experimentation, one could open the mind so that truth could enter. Bacon's scientific method is testimony to his belief that scientific knowledge belied the idols which were worshipped by the dogmatists of his day.

The pragmatic philosophers questioned the extent to which the mind could be opened. Knowledge, they said, is an activity which generates solutions in a problematic situation; both the problematic situation and

the activity include social and individual processes. "Since man inevitably lives and acts in the presence of others, his actions impinge upon them and theirs upon him, and so *most* problems, the pragmatists have come to hold, must be seen as basically social in character" (Prosch, 1964, p. 342). Thus, the idols Bacon described are seen by pragmatic philosophers as social processes involved in the development of knowledge.

Perhaps the most eloquent statement of the relation of these social processes to knowledge was that of Karl Mannheim. His sociology of knowledge (1936) was an attempt to construct a theory which recognized the significance of the "existential" basis of knowledge. Mannheim argued that, at any time in history, there are simultaneous and contradictory trends of thought struggling with one another in their interpretations of common experience. The key to this conflict is not to be found in any reality, "but in the very different expectations, purposes, and impulses arising out of experience" (Mannheim, 1936, p. 269). The impact of social and historical existence is deeply rooted; the level on which the problem happens to be formulated, and the stages of abstractness and concreteness of a theory, are bound up in social and historical settings.

More recently, the problem of science in its social and historical context has been addressed by historians of science and psychologists. Historians of science, according to Kuhn (1962), have begun to chronicle the contributions of scientists in terms of the contexts of their times, rather than in terms of scientific accumulations. If science evolves so that we are only aware of the way it evolves but not toward what it evolves, what, he asks, do we know about the relationship between nature and scientific theories? The explanation, according to Kuhn (1977), must be either psychological or sociological; it must deal with the "common elements induced by nurture and training in the psychological make-up of the licensed membership of a scientific group" (p. 291). Skinner's (1956) anti-formal appraisal of the scientific endeavor is a refreshing restatement of Bacon's idols. His behavioral analysis of the "common elements" in the "psychological make-up" of his scientific group leads him to conclude that, "The scientist, like any other organism, is the product of a unique history" (p. 99). Sulloway, in his historical analysis of the growth of the myths of psychoanalysis (1979), concludes that the empiricist philosophical tradition enters a peculiar symbiotic relationship with the social processes of science. The result is a unique phenomenon in the development of science: the creation of myths of science and the reinterpretation of scientific history. Gergen's (Note 1) reappraisal of the state-of-the-art of social psychology is a restatement of the importance of social processes in the development of theory.

Intergenerational Transmission and the Development of Scientific Paradigms

From the standpoint of the sociology of knowledge, the history of ideas is the history of successive generations. Although generations may be the

bearers of change in science, these changes occur within an overall context of alternating periods of change and stability; Mannheim's suggestion for the study of generational differences in the transmission of knowledge must be supplemented by a recognition of the concerns of the scientific community in general. That successive generations may see the world differently may be a result of the extremely different roles they play in the development of a paradigm.

Any scientific community shares certain concerns; solving a set of problems, working out the details of the problem, the acceptance of solutions, and the rules and experiences shared by the group (Kuhn, 1962). When the community is in the period of scientific development Kuhn calls normal science, the majority of the problems with which it is concerned fall into three classes: the determination of significant facts, matching facts and theories, and the articulation of theories. When this period of normal science is threatened by what Kuhn terms anomalies, the community is in a period of extraordinary science. "The awareness of anomaly opens a period in which conceptual categories are adjusted until the initially anomalous has become the anticipated" (Kuhn, 1962, p. 64). Not only are anomalies made congruent, but the history of the paradigm is reinterpreted:

> Partly by selection and partly by distinction, the scientists of earlier ages are implicitly represented as having worked upon the same set of fixed problems and in accordance with the same set of fixed canons that the most recent revelation in scientific theory and method has made scientific. (1962, p. 138)

Clearly then, there will be differences in the role each generation plays depending on whether the scientific community of which each is a part is concerned with the problems of normal science or with the problems of extraordinary science. Furthermore, the history of the paradigm will be interpreted differently by the community of scientists that is dealing with the anomalies of extraordinary science as opposed to the community that is concerned with the articulation and development of fact and theory in the normal science period. At no point in time is the distinction between these two roles more apparent than in periods of crisis in science; while one generation is bound to one paradigm, the next generation breaks that paradigm and creates a new one which is then articulated by the third generation.

Both Mannheim and Kuhn might argue for a generational analysis of paradigm-breaking families, although their emphases would not be identical. Mannheim suggested a method of "imputation" in generational analyses; reconstructing the perspectives and styles of thought and relating them to the *Weltanschauung* of which they are a part. Kuhn suggested that by studying the value system or ideology of which scientific theories are a part along with the institutions by which these theories are transmitted, one can better understand the nature of paradigm shifts. "Knowing what scientists value, we may hope to understand what problems will be undertaken and what choices they will make in particular circumstances of con-

flict" (1977, p. 290). The value system of which the paradigm-breaker is a part, the nature of the anomalies discovered or invented, the way both the old value system and the new paradigm are transmitted across generations, the roles played by succeeding generations, and the way history is rewritten in each generation are all the focus of an investigation of the contributions of the individual scientist and the nature of scientific change.

In summary, the social processes in the generation of knowledge were recognized by Francis Bacon; his scientific method was an attempt to clear the mind of their effects. Mannheim's theory of the sociology of knowledge, on the other hand, was an attempt to incorporate these social processes into the study of knowledge. The social processes in science have been further recognized by historians of science and by psychologists.

One approach to knowledge as a social process is Mannheim's generational analysis; since the interpretation of the world made by different generations may be different, we may chronicle the history of ideas through the succession of generations of scientists. In the development of science, however, this perspective must be supplemented by chronicling the development of the scientific communities to which these generations belong. The tasks of the scientific community are quite different in periods of normal science from their tasks in periods of extraordinary science. In order to chronicle the history of ideas, one must study not only the succession of generations but their place in the general development of the paradigm. This kind of investigation focuses on the ideologies, tasks, and historical perspectives of generations of scientists, and on the way knowledge is transmitted from one generation to the next. In paradigm-breaking families, one might expect to find the greatest diversity of roles across generations.

The Case of Psychology: Wundt and Freud

In his original discussion of scientific development, Kuhn (1962) distinguished between paradigmatic and pre-paradigmatic sciences. Since psychology has been called a pre-paradigmatic science (Watson, in Hillix and Marx, 1974) and since the examples of scientific development to be given here are from psychology, this issue must be addressed.

By Kuhn's definition, a pre-paradigmatic science is one which is characterized by frequent and deep disputes over legitimate methods, problems, and standards of solution. This definition led Watson to conclude that psychology is pre-paradigmatic:

> In psychology, there are still debates over fundamentals. In research, findings stir little argument but the overall framework is still very much contended. There is still disagreement about what is included in the science of psychology. (in Hillix and Marx, 1974, p. 52)

The science of psychology, he says, has no monolithic paradigm. Rather, there are several systematic prescriptions for psychology. The prescriptions guide psychologists in the formulation and selection of problems.

That particular group of systematic prescriptions for the study of psychology that are present at any one time forms a *Zeitgeist*. When these prescriptions or some combination of these prescriptions become formalized, a school of psychology is formed. What is important for the present analysis is that if there are no paradigms in psychology, Kuhn's model of change is not necessarily appropriate.

That Kuhn believes his model to be appropriate is clear in a later discussion of paradigms; Kuhn (1977) alters his position on pre-paradigmatic sciences. He says, "Whatever paradigms may be, they are possessed by any scientific community, including the schools of the so-called pre-paradigmatic period" (footnote, p. 295). Schools of psychology, then, possess paradigms (now defined in terms of a disciplinary matrix including systematic generalizations, models, and exemplars) and the creation of a school often signifies a paradigm shift. Thus, when we speak of paradigm-breakers in psychology, we refer to individuals who have created new schools of psychology. Two such individuals are Wilhelm Wundt and Sigmund Freud.

Wilhelm Wundt

Wilhelm Wundt has been called the first scientist whose primary interest was psychology (Watson, 1963). But his originality certainly did not inhibit the range of his interests. For Wundt, psychology included more than just that part — experimental psychology — of which he is considered the founder. His study of emotions and his folk psychology are a tribute to his diversity as a scientist. It is a reflection of the intergenerational transmission of knowledge in the development of psychology that his other interests are not as readily associated with his name as is experimental psychology.

Wundt's professional career began in medicine, a field he entered because as a medical student he could earn enough money to live away from home. German medical schools required broad academic training as well as medical training; Wundt was able to pursue a wide variety of topics. Before he even left medical school, Wundt was beginning to think of perception as something psychologically more than physiological sensation (Boring, 1950). Perhaps he was less attached to pure physiology than others because he chose it as a money-making career (Watson, 1963). At any rate, during his medical school days, Wundt was already becoming a psychologist.

His transformation from physiologist to psychologist was not as natural for him as it might have been in the current relative flexibility of interdisciplinary boundaries. In the first place, his own and his colleagues' emphasis on medicine as a physical science meant that Wundt was always aware of the need to make physiology and physiological psychology appear scientific. In the second place, the philosophical tradition of the day (psychology was in the realm of philosophy), as dictated by Kant and Herbart, was that a meaningful psychology could not be experimental. To

legitimate an experimental psychology, Wundt had to contend with opposition from both scientists and philosophers.

He faced the scientific opposition on two fronts: methodology and subject matter. Psychology could be scientific if it employed scientific methods, and to Wundt this meant physiological methods; the result was his scientific introspection. This left little question in his mind about where psychology should begin: its subject matter was to be the simple, formal elements of experience.

Wundt was to face philosophical opposition for years to come. The first step toward a union of his psychology and philosophy was his accepting a chair in philosophy at Leipzig. It was there that he established his psychological laboratory and found himself at the head of a school of psychology with students who were "united in their systematic views as well as showing a common purpose" (Watson, 1963, p. 247). Boring (1950) summarized Wundt's work to this point:

> In 1890, Wundt had got experimental psychology permanently established in the world of science. He had christened the new psychology "physiological psychology". He had made the argument for a scientific psychology and had begun experimental psychology. He had founded the first laboratory or institute of psychology and proved that it could be productive. The researches were increasing and the facts were piling up. Wundt had begun a journal of theoretical and experimental psychology and had maintained it. . . . [T]he character of the new psychology in Germany was already predetermined by Wundt. To some extent, he had also predetermined American psychology. (pp. 325-326)

Of the one hundred or so studies which came out of the Leipzig laboratory over its twenty-year history, Wundt's influence is seen in many, since he typically assigned problems to his students. But, though he assigned problems in sensation, perception, association, and reactions — problems with which he was concerned — his experimental psychology had entered a new period; his ideas were being articulated not by him but by his students. Between 1875 and 1919, 186 dissertations came out of Wundt's laboratory. Many important figures in the history of psychology — including Emil Kraepelin, G. Stanley Hall, Lightner Witmer, James McKeen Cattell, and Edward Titchener — trained in "pure" psychology with Wundt. One facet of this training was Wundt's views on the limitations of experimental psychology: Wundt believed that experimentation must fail when more complex problems than perception were considered. His opposition to the application of experimental psychology meant that for many of his students "most of the history of psychology following Wundt consisted of rebelling against the limitations he had placed on the field" (Watson, 1963, p. 257). The work of some of his students carried them into areas he considered beyond the limits of his science. Those students who exceeded those limitations were either encouraged to leave psychology or lived with Wundt's opposition: He advised Kraepelin to enter psychiatry and always opposed Hall's genetic psychology on the basis of its lack of experimental control.

Perhaps because of his concern over the development of divergent trends

in psychology, Wundt turned toward laboratory work and became less involved with students. This allowed him to return to projects he had interrupted when his experimdntal psychology became popular: the psychology of emotions and the natural history of humanity (Boring, 1950; Riegel, 1977). These complex phenomena demanded a new psychology to supplement his experimental science — a folk psychology of the chief products of mental life, including myths, language, and custom. With the folk psychology and the experimental psychology, Wundt met the demands of the physiological and philosophical paradigms which guided him in his own intellectual development. Psychology was scientific and concerned with complex phenomena as well.

Wundt's social psychology attracted little attention, though (Gergen, Note 1). His older students were already practicing their own versions of his experimental psychology. His withdrawal to his laboratory and his focus on social psychology left him with few new students; "by now, Wundt exerted little influence upon the new generation of potential converts" (Riegel, 1977, p. 18).

Wilhelm Wundt was a central figure in a three-generational paradigm-breaking family. His education in scientific psychology was modeled on the physical sciences and clearly distinguished the science of physiology from the philosophical problems of psychology. His experimental psychology was his reaction to the inadequacies he saw in that education — a reaction which created a new school of psychology. As he successfully contended with scientific and philosophical opposition from the old paradigm, he attracted students whom he set to work on problems he believed were central to the development of the new school. But his students represented a third generation and the paradigm they articulated was as much their own as it was Wundt's. He began to devote less time to the transmission of knowledge across generations and to spend more time generating knowledge relevant to his goals for psychology. The natural extension of his experimental psychology was into the realm of higher mental processes; to this end he developed his folk psychology. Experimental psychology and folk psychology met the demands of the physical science and philosophical paradigms of his time. But since he no longer maintained much influence over the students at Leipzig, his folk psychology was not accepted into the mainstream of the psychology he had created.[1]

Sigmund Freud

In the middle of the nineteenth century, four Austrian physiologists jopned forces to fight vitalism, the notion that life involved forces other than those found in the interactions of inorganic matter. To these four — Carl Ludwig, Emil du Bois-Reymond, Ernst Brücke, and Hermann von Helmholtz — the scientific investigation of organisms depended on the

[1]Gergen's (Note 1) reappraisal of social psychology acknowledges Wundt's contribution to social psychology. It appears that it was not the merit of his ideas on this subject that kept them from being influential, but the timing of Wundt's career development.

reduction of vital forces to physical-chemical forces. Du Bois and Brucke signed a pledge swearing their allegiance to the anti-vitalist cause:

> No other forces than the common physical-chemical ones are active within the organism. In those cases which cannot at the time be explained by these forces one has either to find the specific way or form of their action by means of the physical mathematical method or to assume new forces equal in dignity to the chemical-physical forces inherent in matter, reducible to the force of attraction and repulsion. (quoted in Jones, 1961, p. 30)

With growing acceptance of Helmholtz's paper on the conservation of energy, the anti-vitalist aspirations of the group gained ground. In the meantime, Brücke had obtained a new student named Sigmund Freud.

Freud had entered medicine because it gave him the opportunity to earn money while he studied and did research. Intellectually, he had been stimulated by Darwin's theories on the relationship between humans and nature; the field of medicine would allow him to pursue this interest in a scientific manner, science being the answer to all problems in the nineteenth century (Jones, 1961; Sulloway, 1979). He also recognized in science qualities he found lacking in himself: exactitude, measurement, and precision. He was later to say, "As a young man I felt a strong attraction toward speculation and ruthlessly checked it" (quoted in Jones, 1961, p. 23). This was the Freud who became the student of Ernst Brücke.

Brücke was an example of the disciplined scientist Freud thought he should be. He learned from Brücke that psychology was the study of the central nervous system and that "psychical energy was physical energy which is supplied by the brain cells" (Boring, 1950, p. 709). He also learned that there was only one form of reductionism possible in the science of living organisms: the reduction to physical-chemical forces. If it appeared to the scientist that there were ends toward which biological events were developing, Brücke pointed out, then the scientist "must work a little bit harder to find the underlying causes of these apparent final causes" (Rychlak, Note 2). Freud was already interested in Darwin's theories and Brücke's confirmation of Darwin's denial of final causes probably intensified Freud's interest in evolution.

On Brücke's advice (on the basis of Freud's financial situation), Freud left his teaching career and his theoretical work and began to practice medicine. During his time as a student and early in his career, he maintained a rigid conception of science as purely laboratory work, publishing on various aspects of the brain and nervous system (Jones, 1961). During these years, Freud came under many influences, but perhaps most important was his encounter with Charcot in France. Charcot made the remarkable statement that mere ideas could cause disease — and supported the statement. Freud's later work with Breuer resulted in the therapeutic method of free association and in his theory of the sexual etiology of neuroses. Freud's own developing ideas about human behavior were leading him toward a conflict between two forms of reductionism which would trouble him for much of his intellectual career. His encounter

with the second form of reductionism — historical-evolutionary reductionism — occurred in his relationship with Wilhelm Fliess.

Fliess provided Freud not only with serious criticism of his own theories, but also provided him with clinical evidence supporting Darwin's notions. Fliess offered concrete support for the evolutionary model of periodic cycles and bisexuality in human development. In Fliess, Freud may have found evidence that convinced him of the scientific merit of historical-evolutionary reductionism and final causes (Sulloway, 1979). He began to emphasize the importance of phylogeny and ontogeny in the development of neuroses. Following this period of close collaboration with Fliess, Freud's ideas matured, gained increasing attention,[2] and he attracted his own group of students.

Freud's psychology was from the beginning an attempt to apply Brucke's principles to mental phenomena (Jones, 1961). He was always uncomfortable speaking of meanings, motives, and purposes; in doing so he felt more like a novelist than a scientist. In order to "appease his conscience as a natural scientist" (Jahoda, in Fleming and Bailyn, 1969, p. 442), he courted two theories, one of purpose and one of cause; he used the latter to explain the former in terms of energy and neuro-physiology. The conflict between these two theories, representing historical-evolutionary and physical-chemical reductionism, was not resolved at the time Freud began to train a new generation of psychoanalysts. But after his attempt to reduce his psychology to physical-chemical forces failed with the *Project for a Scientific Psychology* (Sulloway, 1979), Freud turned to a more developmental perspective on the etiology of neuroses. He wrote to Fliess, expressing his dismay at his failure, "Perhaps you may supply me with some ground on which I shall be able to give up explaining things psychologically and start finding a firm basis in physiology" (quoted in Sulloway, 1979, p. 130). Whatever the form of reductionism Freud favored, he never attempted to cut himself off from his biological background; his intellectual history is the history of an individual attempting to reconcile that background with the inadequacies he saw in it. It was this constant appeal to biology that convinced Freud that he had created a universally valid theory of human thought and behavior (Sulloway, 1979).

Freud, the teacher, was concerned not only with transmitting his ideas to a new generation, but with avoiding an oversimplification of his theories to biology. "Freud's followers encountered him at a time when his environmentalist leanings, together with his therapeutic optimism, were in decided retreat" (Sulloway, 1979, p. 438). Freud, the paradigm breaker, found himself at the head of a school of psychology with a group of theories he had not yet reconciled to his own biological, reductionist background. He hoped to prevent premature biological interpretations of

[2]The notion that Freud's work was rejected from the outset in the sexually repressive climate of Vienna is dismissed by Sulloway (1979). This is one of the myths that evolved along with psychoanalysis; Freud's work was given serious critical evaluation from the beginning.

his theories so that he could discover the true relationship between psychoanalysis and biology. He encouraged his students to consider environmentalist views: "They had to learn," he said, "to limit themselves to psychological ways of thought" (quoted in Sulloway, 1979, p. 439). As a result, his students were uninformed about the history of Freud's ideas. Erik Erikson recalls his days as a student:

> We students knew little of his beginnings, nothing of that mysterious self-analysis which he alluded to in his writing. We knew people whom Freud had introduced into psychoanalysis, but psychoanalysis itself had, to all appearances, sprung from his head like Athena from the head of Zeus. (quoted in Sulloway, 1979, p. 486)

Some of Freud's disciples seemed to detect that his theories owed a great deal to biology. With these pupils, Freud, who was continually concerned with the possibility that psychoanalysis would be simplified to biology, developed somewhat hostile relationships. Concerning one of Adler's early works, for example, Freud wrote, "One faces his exposition with a certain feeling of alienation, because Adler subjects the psychological material too soon to biological points of view, . . . The example of Fliess, who offers a biological characterization, has misled many" (quoted in Sulloway, 1979, p. 430). Those who exceeded the limitations he placed on psychoanalysis — Jung, Rank, and Adler among them — were banished from the movement and the inner circle of Viennese analysts. The scientific community grew suspicious of psychoanalysis since it was no longer one unified school, but three separate and warring ones: Freud's Vienna group, Jung's Swiss group, and Adler's Society for Free Psychoanalysis. Freud asserted his claim to the methods, theories, and distinctiveness of psychoanalysis in *On the History of the Psychoanalytic Movement* (1914).

To his students also went the task of responding to critiques of the movement. Freud had neither the time nor the inclination to respond to all the demands made on him. His students responded with argument rather than an interest in understanding the issues, alienating some who had previously supported Freud. Increasingly, Freud's followers were criticized for taking psychoanalysis for granted and for their unwillingness to debate or prove their assumptions. For instance, responding to an attack on Freud by Jung, Sachs, rather than responding to the criticism, retorted that Jung's own theories were too vague: a Swiss, he said, given a choice of two open doors, one containing paradise and the other a lecture on paradise, would choose the second (Jones, 1961).

Meanwhile, Freud himself was rapidly developing in a direction which would accentuate the difference between his theories and those his students articulated. In *Beyond the Pleasure Principle* (1920), Freud used the notion of the death instinct to unite his concepts of narcissism, ontogenetic recapitulation of phylogeny, and regression (Sulloway, 1979). This new conceptual integration allowed him to extend his biogenetic views across the life-span and it was based almost completely on historical-evolutionary reductionism. The acceptance of this development by the first-generation

students was summarized by Rapaport: "[The death instinct is] a speculative excursion which does not seem to be an integral part of the theory" (quoted in Sulloway, 1979, p. 414). Freud's shift to an historical-evolutionary reductionism, based on ultimate causes, provided him a resolution to his bio-psychological conflict and was the final articulation of his psychoanalytic paradigm. For his students, though, the conflict had never been important, so Freud's resolution went unnoticed — or, when noticed, rejected.

Sigmund Freud began his intellectual development under the influence of the anti-vitalist movement and Darwin's theory of evolution. After his encounter with Charcot and Breuer, the biologist Freud became aware of a conflict which he would face for the rest of his intellectual life: the conflict between the proximal and the ultimate causes of the development of neuroses. It was not until after he had trained a new generation of psychoanalysts that he resolved this theoretical conflict; but by then it was too late. His loyal students were uninterested in the biological assumptions of psychoanalysis. Ironically, Freud himself had encouraged their disinterest because he recognized these assumptions as untested. The biological roots of psychoanalysis, so vital to Freud but unnecessary to his students, provided the theoretical basis for a distinction between the ideas Freud himself articulated and those his students articulated.

Summary and Conclusions

The social processes involved in the generation of knowledge have been recognized along with scientific methods for generating that knowledge. Francis Bacon's inductive method was an attempt to arrive at the truth by ridding the mind of those social effects. Pragmatists recognized the social milieu within which knowledge, as an activity, occurs. Mannheim's sociology of knowledge was a method of investigating the transmission of knowledge by incorporating social processes into the investigation. More recently, the psychologists Skinner (1956) and Gergen (Note 1), and the historians of science Kuhn (1962, 1977) and Sulloway (1979) have discussed the relationship of scientific development to the social processes involved in the generation of scientific knowledge.

Mannheim emphasized generational differences in interpretations of the world. In this paper, I have argued that, since each new generation may interpret the world differently, the history of science is the history of succeeding generations of scientists. Scientific development must also be chronicled as the development of scientific communities, of which successive generations are a part. When these communities are in that period of scientific development Kuhn (1962) calls normal science, the majority of the problems with which they are concerned are either the determination of facts, the matching of facts and theories, or the articulation of theories. When the communities are in that period of science Kuhn calls extraordinary science, they are concerned with the adjustment of conceptual categories so that anomalies may be incorporated. The differences

in interpretation between generations is due in part to the difference in the tasks they face in relation to the development of the paradigm. I have suggested that generational differences will be greatest during periods of paradigmatic crisis; I have proposed that the task of the first generation is that of determination of fact and articulation of theory, the task of the second generation is the reconceptualization of the old paradigm to incorporate anomalies, and the task of the third generation is the determination of fact and the articulation of theory relevant to the new paradigm.

Within psychology, a change in paradigm is seen in the creation of a new school of psychology. Two individuals who are credited with the creation of schools of psychology are Wilhelm Wundt and Sigmund Freud. Wundt developed an experimental psychology to overcome inadequacies he found in a paradigm which assigned psychology to either physiology or philosophy. The students who were attracted by Wundt's experimental psychology applied the science in areas outside the limitations Wundt himself placed on his psychology. Consequently, the application of experimental psychology was done against Wundt's advice and marked a generation transition between himself and his students. For Wundt, psychology included not only the "pure" psychology he taught his students, but a folk psychology of higher mental processes as well. He articulated his folk psychology when he no longer devoted his time to training students; these ideas had much less influence than his experimental psychology did.

Sigmund Freud developed under the intellectual influence of the antivitalist movement. The methods and concepts he learned as a student were later to conflict with his developing ideas about historical-evolutionary reductionism. He had not resolved this conflict to his own satisfaction when he became the head of the psychoanalytic school in Vienna. Freud recognized and resisted the temptation to reduce psychoanalysis to biology and encouraged environmentalist attitudes in his students. His development of the concept of the death instinct united his earlier concepts in a framework of phylogenetic and ontogenetic development — and thus he achieved at last an historical-evolutionary reduction. This theoretical development marked a generational transition between Freud's ideas and those of his students.

I have tried to show how the knowledge transmitted from one generation to the next is affected by the tasks which confront each generation. Both Wundt and Freud detected anomalies in the prevailing paradigms of their day. The school of psychology founded by each of these men was a result of his work on the paradigmatic task facing him — the reformulation of concepts to make the anomalous into the anticipated. Each continued to work on that task for the remainder of his career: Wundt supplemented his experimental psychology with a folk psychology; Freud continued to reconceptualize the biological and reductionistic assumptions of his theories. Their students, however, faced a different task. Though Wundt's students helped him improve the status of experimental psychology, they took his science for granted as a new and distinct science.

Their articulations of his theories carried experimental psychology beyond the boundaries Wundt had sought to establish. His development of a folk psychology was for him a necessary adjustment of his concepts in order that psychology be both scientific and concerned with complex problems — demands of the physiological and philosophical paradigms of psychology that guided his own development. For his students, though, this adjustment was inconsequential. Freud's students helped him defend and articulate his psychoanalytic theories. However, for them, psychoanalysis was a distinctly new psychological paradigm; its relation to the old physical-chemical paradigm was less important than its novelty and potential. Freud's synthesis of psychoanalysis and biology resolved the intellectual conflict that had guided his own work, but it meant little to his students.

It is clear that the term "paradigm breaker" misrepresents those scientists who come to be considered scientific revolutionaries. The work of Wundt and Freud continued to demonstrate the influence of the paradigms within which they had developed as scientists. It is with the next generation of scientists that one sees the change in scientific views that characterizes a paradigm shift. This apparent revolution in scientific development may conceal the accompanying generational conflict in which different scientific generations, representing different paradigms, exist as contemporaries. Thus, the evolutionary nature of science of which Kuhn wrote is better seen as a conflict between contemporary trends of thought, as Mannheim suggested. Of the experiences that contribute to these conflicting trends of thought, different locations in paradigm-breaking families cannot be overlooked.

We see that in the critical synapse between extraordinary science and normal science there is also a generational shift. The interpretation of the new paradigm in relation to the old is different for each generation. The paradigm breaker continues to adjust new conceptual categories to incorporate anomalies into the theoretical framework of the original paradigm. The succeeding scientific generation, however, presumes the distinctiveness of the new conceptual categories. The final conceptualization of a new paradigm by the paradigm breaker is not necessarily identical to that by the succeeding scientific generation. With each generation, with each new scientific context, scientific knowledge is altered as new interpretations are offered. It is in synapses such as that between extraordinary science and normal science that ghosts are called up and scientific history becomes parapsychology.

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