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THE EMERGENCE OF PSYCHOLINGUISTICS

The interdisciplinary activity between psychology and linguistics, known as psycholinguistics, may offer a unique case study in integrating two sciences because parallel episodes of psycholinguistics emerged independently and produced parallel topics and theories. One episode came around the turn of the century, primarily in Europe; the other came in the 1960s, primarily in the United States. They were mirror images of each other, as I hope to point out in this review.

The two episodes – the early and the recent psycholinguistics – were separated by more than just a few decades; they were also separated by the behaviorist movement in the social sciences, by the shift of academic dominance from German to American universities, and by a lapse of contacts between European and American scholars in this field. All but our most recent histories of psychology (and all of our introductory textbooks) still reflect behaviorist and American interpretations of psychology's past, an historical treatment of the field that left later psycholinguists unaware of the earlier psycholinguists whose work they duplicated.

Thus the whims of history provide an opportunity to study an interdisciplinary activity that arose twice, independently, at different times and places. In making comparisons between the two we may find generalities about interdisciplinary activity that are independent of time, place, and culture.

I will speak mostly about the early period of psycholinguistics, though I will draw comparisons with the later period – which is the focus of Arthur Reber's paper following mine.

1.

As an academic specialization modern psychology first precipitated out of the prosperity of the 19th century German universities. The first handbook of experimental psychology appeared in 1874 in Germany, and the first formal recognition of a psychological laboratory came in the late 1870s in Germany. By the end of that century, the new

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experimental or scientific psychology enjoyed wide publicity and public curiosity. For example, the World Fairs that took place around the turn of the century in London, Chicago, and St. Louis offered exhibitions of the new apparatus, the new books, and the new scientists in this field.

In contrast, the specialized study of language in the 19th century was already generations old and well established as an independent university department, often as large as any other department. Language research, or *Sprachwissenschaft* as it was known in Germany, was a senior and an aging member of the academic community. Indeed a time for changes or paradigm shifts in linguistics was apparently well at hand; and it came, first in German Universities, with the commotion that usually accompanies changes in climates of opinion in the course of intellectual history.

The younger linguistic scholars of the day, who cast themselves in the role of rebels, sought to revitalize language studies by importing a newer scientific style of empiricism and quantification into the discipline. This new generation saw themselves as throwing off the perceived stagnant approaches of an earlier time tied to German romanticism. The older, or romanticist approach, viewed language from a context of cultural and aesthetic studies. The new linguists (Oskoff, Leskien, Brugmann, Oertal, Delbrück, Whitney, Paul, Sweet et al.) were especially attracted to the innovative laboratory and quantitative techniques emerging in scientific psychology, even though many other prominent intellectuals of that day received the new psychology with skepticism at best.

As the historian Robins tells it, those new-generation linguists were scornfully labeled the *Junggrammatiker* linguists by several older scholars; it was a label that the rebels defiantly adopted as their banner. But it does not describe their work and may now mislead the historian who reads it mistranslated as "neo-grammarians". *Junggrammatiker* originally reflected only the opinion that these individuals were very young and naive (Robins, 1967).

Those events in linguistics and psychology set the stage for the rise of late 19th-century psycholinguistics. In cutting loose from their immediate past the *Junggrammatiker* linguists found in the adjacent new psychology a springboard that could help energize a new vision of linguistic theory and research. What they soon discovered, however, was a growing variety of psychological theories and methods in con-

flict. As the *Junggrammatiker* linguists matured, they thus fell into a pattern of dissension. Yet this came only after they had spent many hours in attendance at the lectures of the "new psychologists" at pioneering centers for psychological research in Leipzig, Berlin, or Göttingen. The new psychologists, particularly Wilhelm Wundt at Leipzig, were eager to oblige and even to claim that language could be explained only on a groundwork of psychological principles. Soon-to-be influential language scholars in attendance at Wundt's lectures included Bloomfield, Mead, Saussure and Boas.

2.

Two lines of psychological theory were particularly prevalent in the German academic community of the late 19th century, or at least they were particularly influential among linguists. One traces back to the philosopher-psychologist Johann Herbart – a formalistic and mechanistic cognitive psychology of mental process formed with an elaborate theory of mental associations. Herbart's laws of cognitive processes define mental schemata that change and adjust to experience according to principles of accommodation, assimilation, fusion, and other patternings. This system of thought is found today in several areas of modern psychology – Piaget's developmental psychology is a notable example.

Electronic computers, of course, were not conceived of in Herbart's time early in the 19th century, but in a sense his description of mental processes seems based on machinelike metaphors – the flows and interactions of configurations of information through an information processing system. Soon the Herbartian accounts of mental processes were to serve the new experimental psychology, with perhaps the best example being the experimental work on memory and perception that came from G. E. Müller's laboratory at Göttingen University for approximately thirty years.

The most vocal opponent of that orientation was, as few realize anymore, Wilhelm Wundt, founder of the psychological laboratory at Leipzig. Over the course of a sixty-year career, Wundt never tired of defending certain German idealist traditions of thought – such as those of Leibniz, Fichte, and Schopenhauer – against the mechanistic Herbartian school. The roots of Wundt's system came from those

idealist philosophers who drew an organismic view of mental processes and gave priority to emotion, purposiveness, and volition.

Linguists now found themselves divided over which psychological system to follow. The best-known early commentary on this state of affairs came in a monograph written in 1901 by linguist Bernard Delbrück, who suggests rather timidly that perhaps linguists should go their own way, and that as far as linguistics is concerned, it matters little which psychological theory is correct.

Hermann Paul was the linguist who applied Herbartian psychology most thoroughly to linguistic theory in his widely read book, the *Prinzipien* of 1880 (the 5th and final edition of that work appearing in 1920). The leader of those linguists who built their linguistics on Wundtian psychological theory was no less than Wundt himself who wrote and lectured extensively on purely linguistic topics. Wundt's most visible achievement in linguistics is the 1900 book *Die Sprache* (Language), which by 1913 had been expanded to two volumes comprising 1367 pages. It is the summary of Wundt's thirty-year involvement with the psychology of language. Many but not all of the topics he addresses there were taken up again in the later psycholinguistics that began in the 1960s. For instance, Wundt covers child language acquisition, language perception, grammatical structure, phonological systems, sign language, language change, and a variety of techniques for the examination of language performance – such as the systematic analysis of speech errors – and there are other topics (Blumenthal, 1970).

Psycholinguists and linguists are little aware today that the most influential individual in the early history of American linguistics, Leonard Bloomfield, was initially a Wundtian, and that his 1914 book, *A Study of Language*, illustrates Wundtian psychology of language; he assumes, for example, that references to mental states or processes are necessary in explanations of language. By the 1930s, of course, Bloomfield had abandoned Wundt and had converted to behaviorism, and dropped those mentalistic references. If he had not made that conversion, I dare say the name Leonard Bloomfield would be much less known today.

In Wundt's works, language is explained as beginning in expressive gestures (often innate emotional reactions, as described in Darwin's book, *The Expression of Emotion in Animals and Men*, 1872). Wundt speculates that this occurred in the evolution of our species as well as

in the language acquisition of every infant. The fundamental unit in Wundtian linguistics is the *sentence*, which he defined in mentalistic terms, and which is prior to words and word orderings. The particular form that spoken sentences take is a result, in Wundt's system, of universal characteristics of human mental processes, namely the time- and information-handling constraints on selective attention and immediate memory.

Wundt's invention of the tree-diagram (1883b) as a method of parsing sentences for grammatical study was originally intended to show the operations of selective attention in controlling language performance – or more specifically, for converting mental representations into sentences.

For Hermann Paul, who followed the more atomistic Herbartian psychology, the unit of language was the word, or sometimes the elemental speech sounds; these were seen as being strung together in the mental processes of the speaker to form strings which add up to sentences. One image or thought pops into the mind at a time, each in turn being converted into a word by the speaker.

To translate into the terminology of present-day cognitive psychology, the position of Herbart and Paul was biased toward "bottom-up" information processing – building sentences up from elements; whereas Wundt's position was biased toward "top-down" processing – sentences were seen as the result of the mental decomposition of a unified mental representation (*Gesamtvorstellung*).

3.

Serious students of this subject should examine the large body of empirical psycholinguistics research from the turn of the century that bears on these issues (not only Wundt's volumes (1900/1913), but also other handbooks of psycholinguistic data, such as Dittrich's *Grundzüge der Sprachpsychologie* (1903), Stern and Stern's *Die Kindersprache* (1907), and Van Ginneken's *Principes de psychologie linguistique* (1907)). The loss of that early literature was rooted, it seems to me, in the ground-shifting re-interpretations of psychology in the early 20th century. Yet that early psycholinguistic literature now receives some attention, especially because of its lack of the mythical specter created by later historians – the so-called "introspectionist school" of psychology. The journal in which Wundt published his

work and that of his students (the *Philosophische Studien*, 1883–1902) contains 183 papers on psychological topics. Only four of them contain introspections, none of which is authored by Wundt. The longest and most forceful arguments in the psychological literature written in refutation of introspection as a technique for experimental psychology are articles appearing in 1883, 1888, 1899, and 1907, all by Wundt.

As several recent historians of psychology have shown (Danziger, 1980; Blumenthal, 1984; Murray, 1983), what came to be called the instrospectionist movement was a brief bubble on the surface of psychology that appeared in the first decade of the 20th century and that burst almost as soon as it appeared. The movement was largely the effort of two renegades from Wundt's objectivism – Edward Titchener at Cornell and Oswald Külpe at Würzburg. A careful reading shows that Titchener and Külpe took their short-lived introspectionism from certain British empiricist philosophers and from the psychological writings of Ernst Mach.

4.

Returning to psycholinguistics, the conflict between Wundt and Paul comes to the surface most clearly in Wundt's claims that the human mind is in essence creative – that thoughts, perceptions, and memories do not derive from an inventory of isolated mental impressions strung together in associative chains. Rather, cognitive processes and their expressions in language are constructions that are developed from germinal mental impressions. This creative activity was, in Wundt's system, under the control of a central, selective process or attention. Wundt cited the writings on language of Wilhelm Humboldt (from nearly a century earlier) as an historical precedent for these views. And those are the same citations that would be used by a much later linguist, Noam Chomsky, to support his influential and similar claims about language, though he does not make language so subservient to psychological principles as did Wundt (Chomsky, 1966).

Paul and his followers faced the question of language creativity (the novelty of expression allowable in human language) with explanatory devices such as "analogy formations" and "generalizations", all taken from classic associationistic psychology. I first learned my psychology of language and my history of psychology from the late Erwin Esper,

who had studied in Europe early in this century and who later operationalized Paul's notion of "analogy formation" into an early but fairly well-known behaviorist experiment on what he called language (Esper, 1925). (He had used strings of nonsense syllables as stimulus items, and tested subjects' abilities to generalize rules for combining them.) As the 80-year-old Esper once told me, Paul's approach to language did not require a "mystical" central control process in the mind.

Because for Wundt sentences are mere reflections of unified mental representations, those reflections in his linguistic analyses can take any number of physical forms though still representing the same mental state. He was thus able to differentiate sentence patterns such as active, passive, question, and so on as transformationally related to one another. The underlying mental representation he called either the "deep" (*tiefe*) or the "pure" (*reine*) structure of the sentence; whereas the physical representation of the sentence in the speech code he called the "*Oberflächenstruktur*" (surface structure). These are the same concepts with which Noam Chomsky inspired a transfiguration of linguistics in the 1960s.

Not only do we find the stand-off between Wundt's and Paul's psychological systems at the turn of the century, but we also find an increasingly complex array of fractionated psychological systems. And so the situation for the linguist who attempted to build linguistics out of psychological theory grew precarious. Delbrück's suggestion, cited earlier, that linguists should remove themselves from the spheres of psychological theory now began to have appeal. He had argued that linguistics is fundamentally a different discipline, that language may, indeed should, be described without reference to psychological processes. It is not the purpose of linguistics, he argued, to explain what humans do with language; rather, language must be studied as an abstract formal tool. Linguists are thus only concerned with the structures and interrelations of code systems – German, English, Russian, Chinese, Swahili, etc. Descriptions of the formal aspects of these codes are logically different from descriptions of how people perceive, learn, remember, or think.

Eventually Delbrück's argument, a declaration of linguistic independence, succeeded and had a liberating effect upon linguists. For instance, the Wundtian linguist Leonard Bloomfield (an American) found himself faced in the 1920s with the sudden disappearance of

Wundtian cognitive psychology and the rise of behaviorism. Bloomfield adeptly converted to behaviorism, but thereafter resisted the incorporation of psychological mechanisms into linguistics. A few behavioral mechanisms are suggested in his 1933 book on language, but no psychological theory is present to any degree like it was in his 1914 book. Bloomfield indeed gave full voice to Delbrück's 1901 suggestions in a 1926 monograph titled *Postulates for a Science of Language*. So then the divorce was complete. The self-consciously independent linguistics now went largely its own way into a fruitful period that witnessed the development of phonetics, phonology, and morphology. And now linguists typically, even meticulously, avoided all references to mental processes.

My early teacher, Esper, then felt left out in the cold; he had known Bloomfield personally in the 1920s and had witnessed Bloomfield's loss of interest in psychology. Esper had invested his academic career in psycholinguistics, and had hoped that with the decline of Wundtian cognitive psychology and the rise of behaviorism that new psychologist-linguist interactions would continue in a purified behaviorist form (Esper, 1935). Not only did linguists desert him, but behaviorists now found more inspiration in the performances of rats, pigeons, and monkeys, performances in which the problems of sentence structure, phonology, or morphology disappeared. Esper and frequently another minor behaviorist, J. R. Kantor, pleaded unsuccessfully, as voices in the dark, for a reunification of psychology and linguistics (Kantor, 1936). By the 1930s, the Zeitgeist had abandoned them.

5.

The years passed. Monumental works of structuralist linguistics accumulated and prompted the founding of a new academic department in many American universities – the linguistics department. The faculty in these new departments, as it seemed to me when I was a graduate student, were young and fresh in mind and work. At the time, I was interested in the psychology of language but had grown weary, as a student in the 1960s, of what seemed to be the awkwardness, or perhaps unreality, of the neobehaviorist approaches to language behavior.

Then Noam Chomsky came to my school, the University of Washington, to give a series of lectures purportedly to show that the

syntax of sentences could in principle never be approached with the conceptual tools of structuralist linguistics or of behavioral psychology. Quickly a spirit of intellectual rebellion was in the air; Chomsky offered what seemed a radically new way to talk about language, one that allowed me for the first time to speak of mental processes. He no less than required that mental structures must be assumed if language is to be explained.

A year later, I was in Cambridge, Massachusetts, and every other day or so I dashed off to hear Chomsky's lectures, running shoulder to shoulder with such psychologists as George Miller, Tom Bever, and Dave MacNeil (who now called themselves psycholinguists). We would then return to our psychological laboratories to prove, if we could, that Chomsky's revolutionary statements about language were true and that behaviorist accounts were wrong. In particular, we found that sentences, not structuralist elements, are the true units of language; that sentences bear transformational relations to one another; that human language is fundamentally creative; and that the physical shape of language is only the surface of the utterance which conceals a deeper mental structure.

6.

Today's time limit forces me to conclude quickly with a few observations about this particular interdisciplinary activity. In the early phase of psycholinguistics at the turn of the century, psychology was in the driver's seat: it was the linguist who made the move to cross the disciplinary boundary to hear psychology lectures. Those early linguists then returned to their departments to construct linguistic theory on a basis of psychological concepts (images, mental representations, memories, attention, etc.). Eventually, out of frustrations over conflicting psychological theories, linguists gave up on psychology – or perhaps, they recovered a view of differences in the goals of the two disciplines.

Years later, a similar drama played out – with the disciplinary pecking-order reversed. In the later episode, psychologists were the ones to cross the disciplinary boundary to listen to linguists. That was followed by efforts to build a psychology of language (sometimes even a whole cognitive psychology) on a basis of formal linguistic theory. We have recently seen remarkable efforts from psychologists to write

"grammars" of language performance, to describe cognitive processes in terms of "subjective lexicons", to describe memory as a "propositional network" built out of elemental syntactic relations, and also to speculate about "a language of thought".

With the recent proliferation of formal linguistic theories (often in conflict) since the mid-1960s, discussions again arise about differences in the goals of linguistics and psychology (see Reber, this issue). Cognitive psychologists now begin to turn away from linguistic theory, no longer accepting it as a guide for psychological theory.

The history of psychologist-linguist interactions might be viewed as an unhappy one – periods of heady optimism with the integration of the two disciplines followed by disillusionment and separation. There is a brighter view, however. Both fields came to the aid of the other, forming a brief union that helped launch a shift of view (a "paradigm shift"?) in the one discipline that appeared to some practitioners as caught in a stagnant position. This happened once in the late nineteenth century when linguists came to psychology to find revitalization. It happened again just past mid-20th century when psychologists came to linguists for insights that helped psychology (or at least a faction within psychology) recover an awareness of cognitive or mentalistic phenomena.

In conclusion, we find that a true, or balanced, integration of these two disciplines never really took place. In one episode, discipline *A* dominated discipline *B*, so that *B* briefly became a branch of *A*. In the other episode, *B* dominated *A*. Perhaps that pattern is typical among other sciences where disciplinary integrations are attempted. I will leave that question in the hands of the other participants in today's conference.

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