

# TRACKING TRENDS IN PSYCHOLOGICAL SCIENCE

## AN EMPIRICAL ANALYSIS OF THE HISTORY OF PSYCHOLOGY

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### INTRODUCTION

Debates about scientific trends pervade all fields of scientific research. Scientists often monitor and discuss the amount of attention given to the various schools of thought within their field, and they typically hold strong views about which schools are currently “hot.” Competition among opposing schools can produce a continuing tug-of-war between prevailing and competing ideas, providing fertile ground for speculation. Although such debates may stimulate lively conversation, they are rarely informative and often misguided. Unfortunately, scientists often make consequential decisions—about allocating funding, hiring faculty, and so on—based on their personal views. Such decisions profoundly shape the direction taken by a science, and thus should be guided by empirical research rather than mere speculation.

Since the birth of scientific psychology more than a century ago, many schools have risen and fallen from prominence. Much has changed since Heidbreder (1933) described the early days of the field in terms of “seven

psychologies." Over the past several decades, four major schools have competed to become the predominant model for understanding human behavior: psychoanalytic, behaviorist, cognitive, and neuroscientific.

Lively polemics surround the debate concerning which of these four schools are becoming more influential and which are waning in prominence. If you ask psychologists which is the prevailing school of thought, you are likely to get different answers depending on the affiliation of the person you ask. The psychoanalytic perspective, first, has recently come under fire, with *Time* and other popular magazines asking "Is Freud dead?" Within scientific journals, however, debate continues over the prominence and relevance of Freudian ideas to contemporary psychological research. For example, Crews (1996) recently wrote, "[T]here is literally nothing to be said, scientifically or therapeutically, to the advantage of the entire Freudian system or any of its component dogmas" (p. 63). In response, Westen (1998) argued, "although commentators periodically declare that Freud is dead, his repeated burials lie on shaky grounds" (p. 333); "Freud has left an important—and I believe indelible—mark on human self-understanding" (p. 362).

Another popular contention is that the cognitive perspective now dominates psychological science, having prevailed over psychoanalysis and the subsequent Skinnerian behaviorist tradition (e.g., Baars, 1986; Gardner, 1985; Hunt, 1993; Sperry, 1988); Nobel laureate Roger Sperry has claimed that this "cognitive revolution" is "widely recognized and well-documented . . . and appears to constitute a true shift of paradigm" (Sperry, 1988, p. 608). In contrast, others have argued that no such cognitive revolution has occurred: "the repeated declaration of a revolution may be more a reflection of the enthusiasm many cognitive psychologists have for their subdiscipline than of actual events" (Friman, Allen, Kerwin, & Larzelere, 1993, p. 662). Similarly, Leahey (1991) suggested that "Cognitive scientists believe in a revolution because it provides them with an origin myth, an account of their beginnings that helps legitimize their practice of science" but, he bluntly states, "there was no revolution" (p. 362).

Others have come to the defense of the behaviorist school: "although I have conducted no study, prepared no in-depth interview, nor even any shallow survey of opinions, I do contend that behavioral analysis is alive and kicking and that I for one knew it all along" (Salzinger, 1994, p. 816). Pierce (1996) agrees, "Behaviorism is not dead . . . the field of behavior analysis continues to thrive and progress, even in the absence of its mentor B. F. Skinner" (p. 461). Similarly, Friman et al. (1993) have concluded emphatically, "reports on the death of behavioral psychology . . . appear greatly exaggerated" (p. 664).

Finally, and most recently, some have argued that the neuroscientific perspective is flourishing (e.g., Churchland, 1998)—indeed, the 1990s were designated the “Decade of the Brain” by congressional resolution. There are even concerns (and for some, hopes) that the field of psychology will ultimately be reduced to a subfield of neuroscience (Bechtel, 1988; Miller & Keller, 2000).

In line with our belief that conclusions about trends in the field should be guided by empirical data, several years ago we conducted a series of analyses to chart changes in the prominence of various schools from 1950 to 1997 (Robins, Gosling, & Craik, 1999). In this chapter, we review those findings and augment our earlier analyses by charting these trends through 2002. Based on assertions made in scientific journals, we expected to find evidence for: the decline of the psychoanalytic and behavioral schools, the transformation of the field by a cognitive revolution, and a recent rise in the prominence of neuroscience.

## CONCEPTUALIZING PROMINENCE AND SCIENTIFIC PROGRESS

Before discussing the findings, we first consider several ways of conceptualizing prominence. In our earlier paper (Robins et al., 1999), we defined prominence as the degree to which the mainstream of the field pays attention to a school’s scientific products (e.g., research findings and theories). Thus, our intent was not to trace the history of ideas in modern psychology (e.g., Kendler, 1987), but rather to document specific empirical trends in the amount of attention devoted to each school by the field as a whole. From a Kuhnian (1962, 1970) perspective, the school receiving the most attention could be seen as having attained the status of a dominant paradigm. Kuhn portrayed the development of a science as moving from a *preparadigmatic* stage, characterized by multiple, competing schools, to a *paradigmatic* (or *normal science*) stage, characterized by a single dominant paradigm of shared assumptions and methodologies. Once a field has attained paradigmatic status, further scientific development involves a succession of revolutions in which the dominant paradigm within the field is displaced by a new one. However, a number of scholars have debated whether psychology has even reached the paradigmatic stage of science (e.g., Briskman, 1972; Leahey, 1991; Schultz, 1981; Warren, 1971; Watson, 1977). For example, Masterman (1970) argued that psychology and other social sciences may be characterized by a *multiparadigmatic* stage, which precedes the eventual emergence of a single dominant paradigm.

In contrast to Kuhn and Masterman, Lakatos' (1970) theory of scientific development allows for multiple, competing schools at any stage of a science's historical development. These schools (research programmes in Lakatos' terminology) may coexist indefinitely, and there is no assumption that one school will eventually emerge as the dominant paradigm. Lakatos views scientific progress as akin to a horse race in which competing schools progress, degenerate, get revived, and so on, depending on the ability of the school to generate new hypotheses that lead to empirical discoveries. Lakatos (1970) argued that a school becomes "progressive" when it yields new predictions that lead to empirical successes; Lakatos believed that "empirical evidence is the final arbiter among competing research programs" (Gholson & Barker, 1985, p. 757). Thus, from Lakatos' perspective, a school's prominence could be conceptualized as a reflection of its scientific merit; that is, prominence is attained when the empirical evidence supports the validity and viability of the school's basic assumptions and methods.

In sharp contrast, Latour's (1987) social constructionist view of scientific development suggests that a school's prominence is determined by sociological, not scientific, factors. Specifically, schools rise in prominence when they successfully disseminate their scientific products to the rest of the field through communication networks that determine what becomes attended to and widely known. Conversely, schools decline in prominence when they are no longer able to effectively communicate their findings through journals, conferences, and other outlets for scientific information.

A final perspective is that scientific prominence can be seen as simply mirroring fad and fashion in the field (Christensen-Szalanski & Beach, 1984; Teo & Febbraro, 2002). Teo and Febbraro (2002) argue, "Psychology's history can be studied as a history of fads" (p. 458). For example, according to Christensen-Szalanski and Beach (1984), researchers in the 1970s and 1980s focused on biases in judgment and decision-making because they were jumping on a bandwagon to question the rationality of human judgment and identify flaws in the way people reason (cf. Robins & Craik, 1993). From this perspective, a school's prominence is determined by what's currently in vogue in the broader scientific and intellectual community, not by the ability of a school to document scientific truths or even its ability to effectively publicize its scientific products.

## Measuring Prominence

In Robins et al. (1999), we measured trends in prominence in four of the most influential and widely recognized schools within mainstream

scientific psychology: psychoanalysis, behaviorism, cognitive psychology, and neuroscience. Prominence is a difficult construct to measure, so we searched for convergence across three indices. These three indices assess prominence specifically within psychological science, and not within the sciences and humanities as a whole.

*Assessing the content of flagship journals in psychology*

Our first index was based on an analysis of the subject matter of articles published in four 'flagship' psychology publications: the *American Psychologist*, *Annual Review of Psychology*, *Psychological Bulletin*, and *Psychological Review*. These publications were selected because they aim to publish articles representing the entire field of psychology and because they were the most frequently cited of all psychology journals [*Social Sciences Citation Index (SSCI): Journal Citation Reports (JCR)*, 2001]. The four flagship publications cut across subdisciplines and are read by a broad range of psychologists. The flagship publications serve dual roles in the field: They reflect current trends and they define an agenda for the future. Thus, a school's prominence in the flagship publications can serve as an indicator of its prominence in mainstream scientific psychology. For example, if neuroscience has been increasing in scientific prominence, we would expect to find an increase in articles on neuroscience topics appearing in the flagship publications.

We used the *PsycINFO* database to measure the proportion of articles in the flagship publications relevant to each school. *PsycINFO* permits keyword searches that retrieve all articles containing a specified word stem in one of four locations: the article title, abstract, subject index, and keyword phrases listed by the authors. Keyword stems can be specified with the "#" sign as "wildcard" terms. These stems allow one to search simultaneously for a broad range of terms related to a single topic. Thus, for example, the keyword "psychoanal#" will capture not only the keyword "psychoanalysis", but also the keywords "psychoanalytic", "psychoanalyze", "psychoanalysts", etc. We used the following keywords to represent each school: 'psychoanal#' was used to represent psychoanalysis; 'cognit#' was selected to represent cognitive psychology; 'neuropsy#' and 'neurosci#' were selected to represent neuroscience; and 'reinforc#' and 'conditioning' were selected to represent the behaviorist school (the stems "behav#" or "behavior#" are too generic to be representative of the behaviorist school because assessment of behaviors is an important research tool in all four schools). It is worth noting that these keywords may not be equivalent in terms of representing their respective schools. For example, the keyword 'cognit#' may capture more articles from the cognitive school than the keyword 'psychoanal#' captures from the psychoanalytic school. Therefore,

mean differences among the schools may reflect, in part, differences in the keywords chosen to represent each school, and should be interpreted cautiously. Thus, our keyword analyses focus primarily on *trends* over time.

For each school, we calculated the percentage of articles published in the four flagship publications that included one or more of the keywords selected to represent that school. This index was computed annually from 1950 (the earliest date when all four flagship publications existed) through 2002. Trends in scientific prominence were obtained by plotting these values over time and then smoothing the data.

*Assessing the content of psychology dissertations*

Our second index of scientific prominence was based on an analysis of the subject matter of dissertations. Specifically, we examined the subject matter of doctoral dissertations listed in the *PsycINFO* database from 1967 to 2002. We began this search in 1967 because dissertations in the *PsycINFO* historical database prior to 1967 used a different indexing policy, which did not include subject terms, making searches before and after 1967 incomparable. We searched for the subject matter of dissertations by searching for subject and title words rather than keywords, because the indexing policy changed again in 1995 such that keyword searches before and after that date became incomparable. We computed the index by calculating the percentage of dissertations that included at least one of the subject or title words previously selected to represent each school. Compared to the flagship publications, dissertations may provide a better gauge of cutting-edge research that is attracting the attention of young scientists in the field. Thus, an analysis of the subject matter of dissertations may detect emerging trends earlier than the flagship publications, which may reflect more established scientific perspectives.

*Assessing the citation rates for subdisciplinary journals by the flagship publications*

Our third index of prominence focused more directly on the scientific products of each of the four schools. Specifically, we examined how frequently articles published in subdisciplinary journals associated with each school were cited by the four flagship publications. By determining how many times an article is cited and who cites it, citation analyses provide a valuable empirical gauge of the level of attention an article has received (Garfield, 1979; Robins & Craik, 1993). Because many journals are associated with particular schools (e.g., cognitive psychologists tend to publish in cognitive journals and not psychoanalytic journals), we can examine the scientific prominence of a school by determining how frequently journals

within that school are cited in the flagship publications. If a school has been increasing in prominence, we would expect to find an increase in citations to articles published in its subdisciplinary journals. Thus, we measured scientific prominence by the number of times the flagship publications cited articles published in the top journals in psychoanalysis, behaviorism, cognitive psychology, and neuroscience.

How can one identify the top journals in a school? Friman et al. (1993) developed a set of criteria for selecting the top journals based on citation impact rankings (the number of times a journal has been cited divided by the number of articles it has published over a two year period) and evaluations of influence and importance by experts (journal editors). Using these criteria, Friamn et al. (1993) identified the top four journals for the behaviorist, cognitive, and psychoanalytic schools. We used a similar procedure to identify the top four neuroscientific journals in psychology. However, because the field of neuroscience consists of a broad range of disciplines outside psychology (e.g., neurochemistry), many top neuroscientific journals (e.g., *Neuron*) publish little of relevance to psychologists and high citation rates do not necessarily reflect prominence in psychology. Therefore, we used ratings of influence and importance by neuroscientists working within psychology departments (Robins et al., 1999).

The top four journals from each school are shown in Table 1 in the Appendix. The scientific prominence of each journal was gauged by the degree to which the articles it published were cited in the flagship publications. Specifically, we computed the total number of times per year the flagship publications cited articles published in each subdisciplinary journal. We then summed these citation rates across the four journals associated with each school to obtain an index of the prominence of the psychoanalytic, behavioral, cognitive, and neuroscientific schools. This index was computed annually from 1977 through 2001 (the years *SSCI: JCR* was available).

In summary, we used three different approaches to measure prominence: We looked at the subject matter of articles published in the most influential ("flagship") psychology publications, the subject matter of dissertations, and the degree to which the flagship publications cite articles from each school's core journals. Together, these three indices of scientific prominence allowed us to determine which of the four schools are currently prominent and what specific trends can be identified over the past several decades. By including three measures and searching for convergence across measures, we hope to ensure the generalizability of the findings. To the extent that all three indices point to the same trends, we can be confident that the findings do not depend on biases associated with any single method.

TABLE 1. Leading Journals From Each School

| Journal (2001 citation impact)                                             | Year first published |
|----------------------------------------------------------------------------|----------------------|
| Psychoanalytic school                                                      |                      |
| International Journal of Psychoanalysis (1.0)                              | 1920                 |
| Psychoanalytic Quarterly (0.8)                                             | 1932                 |
| Journal of the American Psychoanalytic Association (0.8)                   | 1953                 |
| Contemporary Psychoanalysis (0.6)                                          | 1964                 |
| Behavioral school                                                          |                      |
| Journal of Experimental Analysis of Behavior (1.4)                         | 1958                 |
| Behaviour Research and Therapy (2.0)                                       | 1963                 |
| Journal of Applied Behavior Analysis (0.8)                                 | 1968                 |
| Behavior Therapy (1.4)                                                     | 1970                 |
| Cognitive school                                                           |                      |
| Cognitive Psychology (3.7)                                                 | 1970                 |
| Cognition (2.7)                                                            | 1972                 |
| Memory and Cognition (1.6)                                                 | 1973                 |
| Journal of Experimental Psychology:<br>Learning, Memory, & Cognition (2.0) | 1975                 |
| Neuroscientific school                                                     |                      |
| Journal of Neurophysiology (3.5)                                           | 1938                 |
| Annual Review of Neuroscience (27.2)                                       | 1978                 |
| Trends in Neurosciences (16.5)                                             | 1978                 |
| Journal of Neuroscience (8.2)                                              | 1981                 |

NOTE: The citation impact of a journal is a measure of the frequency with which the average article in that journal has been cited in a particular year. Citation impact is computed by dividing the number of all current citations to a journal over the previous two years by the total number of articles published in that journal over those two years.

## Findings From an Empirical Study of Trends in Psychology

Our three indices of prominence paint strikingly similar portraits of the recent history of psychology (see Figures 1–3), providing converging evidence for the following conclusions.

### *The death of the psychoanalytic perspective*

According to all three indices, the psychoanalytic school has not fared well over the past few decades. Scientific psychologists have paid little attention to research published in the preeminent psychoanalytic journals and a psychoanalytic focus has been virtually nonexistent in either flagship publications or dissertations. Thus, contemporary psychoanalytic research is not being assimilated directly into mainstream scientific psychology. This does not mean that “Freud is dead,” but rather that his presence may be felt indirectly. Indeed, many of Freud’s basic ideas—for example, that unconscious processes influence behavior and that early childhood experiences

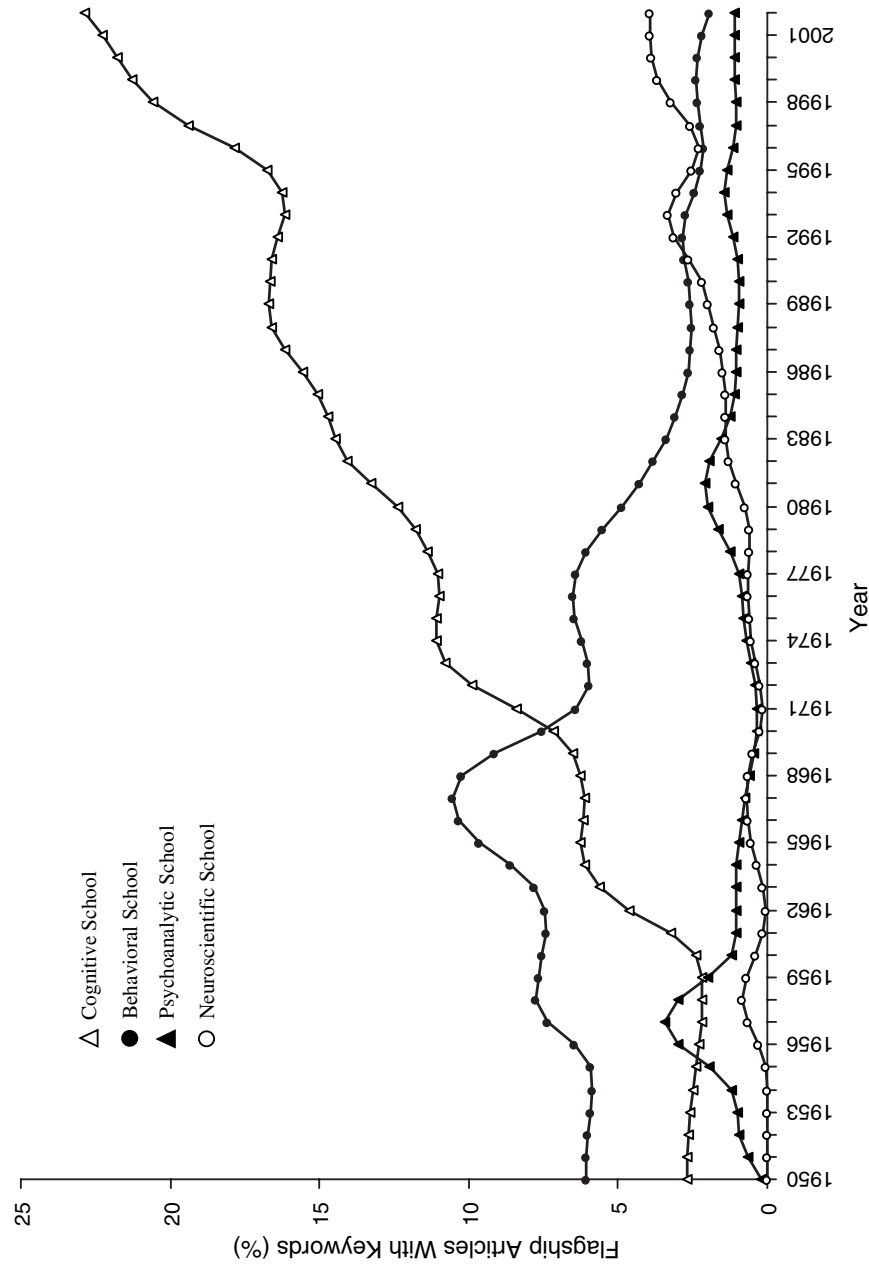


Figure 1. Percentage of articles published in the flagship publications that include keywords relevant to the cognitive, behavioral, psychoanalytic, and neuroscientific schools. A smoothing function was used to transform the raw data.

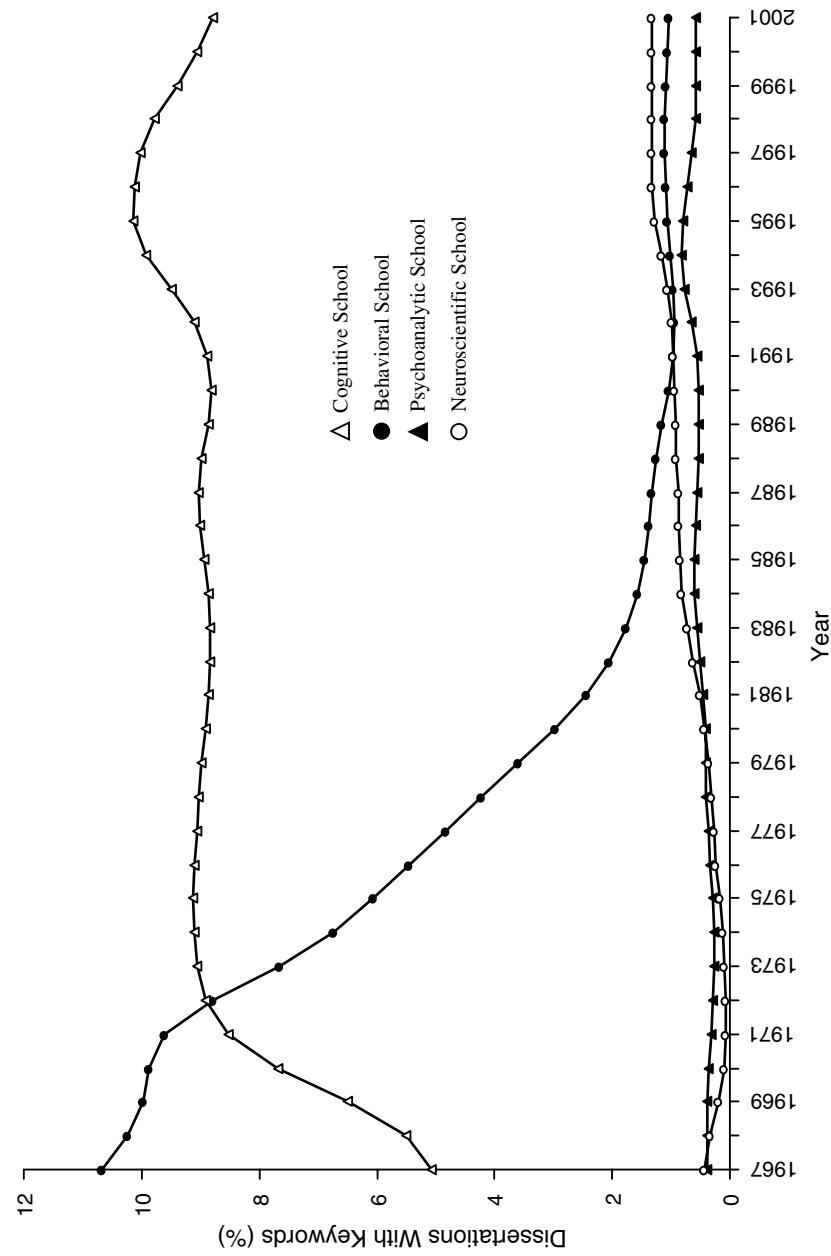


Figure 2. Percentage of dissertations that include keywords relevant to the cognitive, behavioral, psychoanalytic, and neuroscientific schools. A smoothing function was used to transform the raw data.

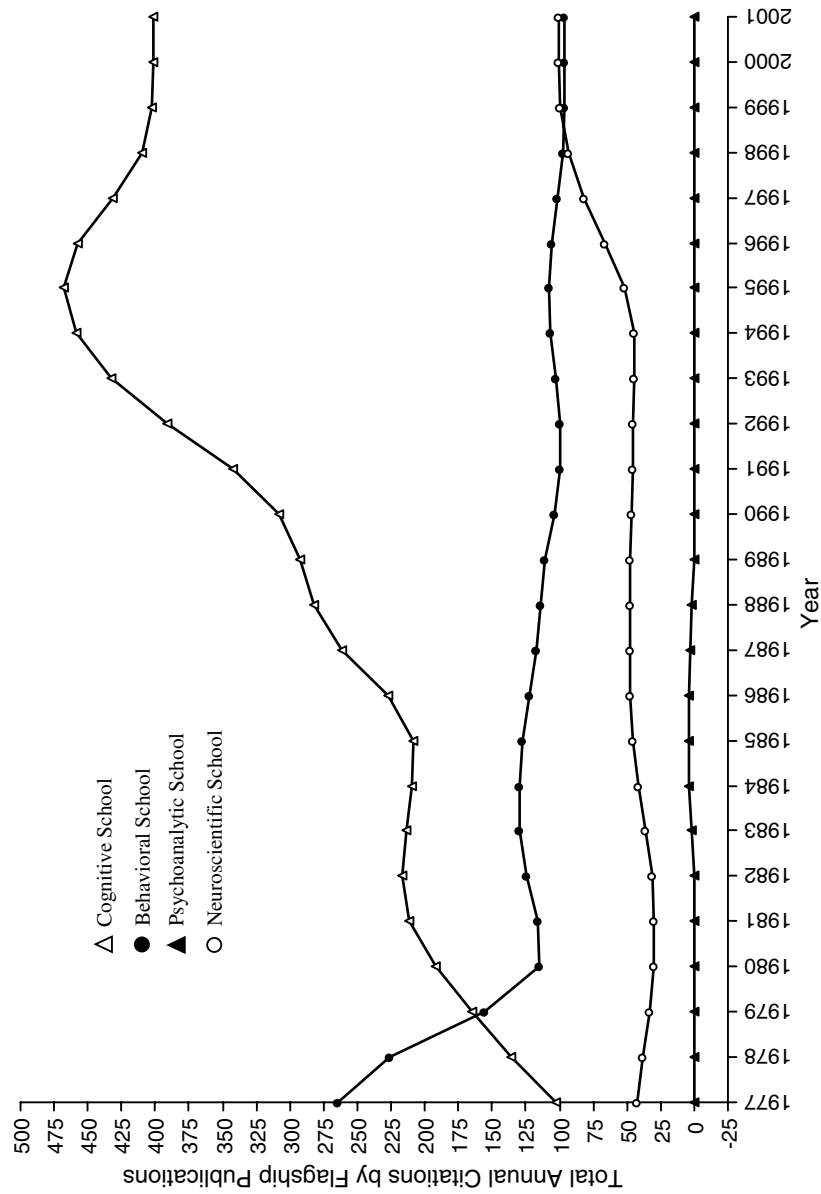


Figure 3. Total number of citations per year by the four flagship publications to articles published in the cognitive, behavioral, psychoanalytic, and neuroscientific journals. A smoothing function was used to transform the raw data.

influence adult development—have become incorporated into the foundation of psychology as a science (Kihlstrom, 1994; Westen, 1998). More generally, psychoanalytic thought continues to be influential in the broader intellectual community, shaping scholarship in the humanities (dissertations such as “Kafka’s Hunger artist and the psychoanalytic approach to literature” are not uncommon) and other social sciences (Friman et al., 1993).

*Behavioral psychology: Reports of its demise are NOT exaggerated*

Despite claims to the contrary, behavioral psychology, and its associated concepts of conditioning and reinforcement, has been on the decline in psychological science. The one apparent exception to this decline was a flurry of attention to the behavioral school in 1992. Closer inspection revealed that this peak was due to a set of *American Psychologist* articles commemorating B.F. Skinner upon his death, which can hardly be taken as an indication of the health of the school. Thus, when graphing the keyword trends, we replaced this extreme outlier (10 standard deviations above the mean) with the mean value for the other 11 months of the 1992 volume of the *American Psychologist*. Overall, our findings furnish hard evidence to substantiate what has become academic lore: Sometime during the 1970s, the prominence of the behavioral school gave way to the ascension of the cognitive school. Furthermore, in the past several years, the neuroscience school has also overtaken behaviorism, as can be seen from all three of our analyses. This picture of contemporary psychology contrasts sharply with the view that behavioral psychology has maintained a high profile throughout the 1980s (e.g., Friman et al., 1993). However, as was the case for psychoanalysis, behavioral concepts and methods continue to be used by psychologists to describe and study human behavior.

*Empirical evidence for a cognitive revolution*

Our analyses showed that the cognitive school has overtaken the behavioral school as the most prominent of the four schools, supporting the claim that there has been a “cognitive revolution.” Interestingly, according to the keyword analysis of the flagship publications, the cognitive school first began to rise in prominence around 1960, soon after the 1956 symposium on information theory which some view as the birth of the cognitive revolution (Gardner, 1985). When did cognitive psychology surpass the behavioral school in prominence? All three indices place the ascension of cognitive psychology over behavioral psychology in the 1970s, although they differ in the precise date. What might account for the cognitive school’s rise to prominence? Although there are certainly many factors, the central driving force is probably the computer revolution. Computers

provided scientists with a new metaphor for conceptualizing how the mind works, one based on information processing and associated concepts of storage, retrieval, computational operations, and so on. Perhaps equally important, computers paved the way for the development of new methods for the scientific measurement of mental processes (e.g., highly controlled presentation of stimuli, reaction times, dichotic listening, simulations of cognitive processes).

However, the cognitive school's dramatic rise in prominence shows some sign of abating—the dissertation subject matter analysis and the flagship citation analysis both show its trajectory leveling off in the 1990s. The flagship subject matter analysis seems to indicate otherwise, but the findings from the dissertations analysis may foreshadow a similar outcome in the flagships over the next several years. It remains to be seen whether this plateau represents a temporary pause in growth or a zenith in the cognitive school's rise to prominence.

*The emergence of a neuroscience revolution?*

In our original study, we failed to find evidence that mainstream psychology was paying increasing attention to neuroscientific research. However, our follow-up analyses demonstrate that over the past five years neuroscience has become increasingly prominent in psychological science, although the magnitude of the increase is relatively modest. All three analyses showed that neuroscience had, by the mid to late 1990s, reached higher levels of prominence than behaviorism or psychoanalysis.

In addition, it is important to note that neuroscience has, for some time, been achieving high levels of prominence *outside* the field of psychology. The four neuroscientific journals examined in the present study are among the most frequently cited of all scientific journals when citations by both psychology and non-psychology sources are considered (see the citation impact values in Table 1). In fact, the *Annual Review of Neuroscience* and *Trends in Neurosciences* have citation rates comparable to the journal *Science*. Moreover, when we compared citations by *Science* to the four core neuroscientific journals we found further evidence for the prominence of neuroscience. As shown in Figure 4, *Science* articles have dramatically increased their citations to the four neuroscientific journals, with the upsurge beginning in the late 1980s (the recent plateau is probably due to the dramatic proliferation of neuroscientific journals, which reduces the number of citations to any single journal). In contrast, *Science* articles rarely, if ever, cite journals from the cognitive, behavioral, and psychoanalytic schools. Also supporting the idea that neuroscience is growing, but not necessarily in psychology, is the fact that membership in the Society for Neuroscience has skyrocketed since it was founded in 1970 (see Figure 5).

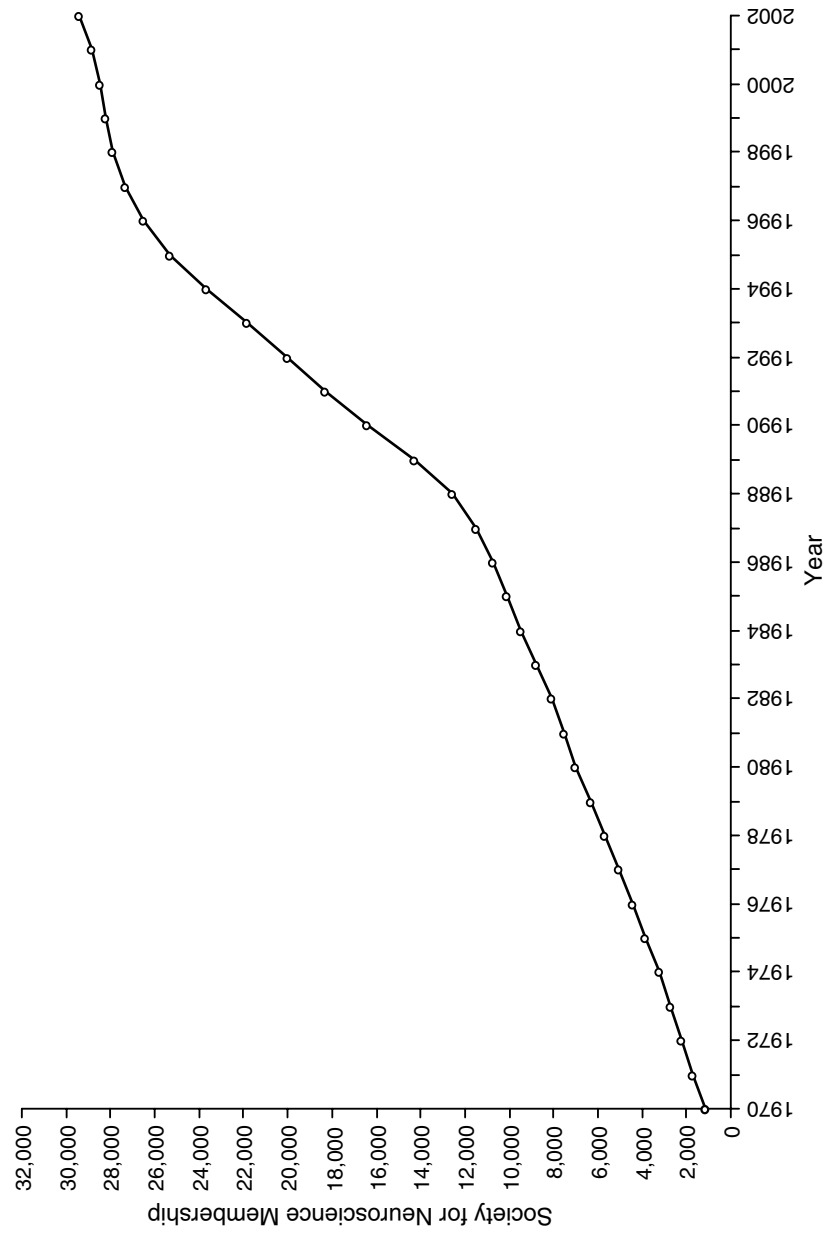


Figure 4. Total number of citations per year by the journal *Science* to the leading neuroscientific journals. A smoothing function was used to transform the raw data.

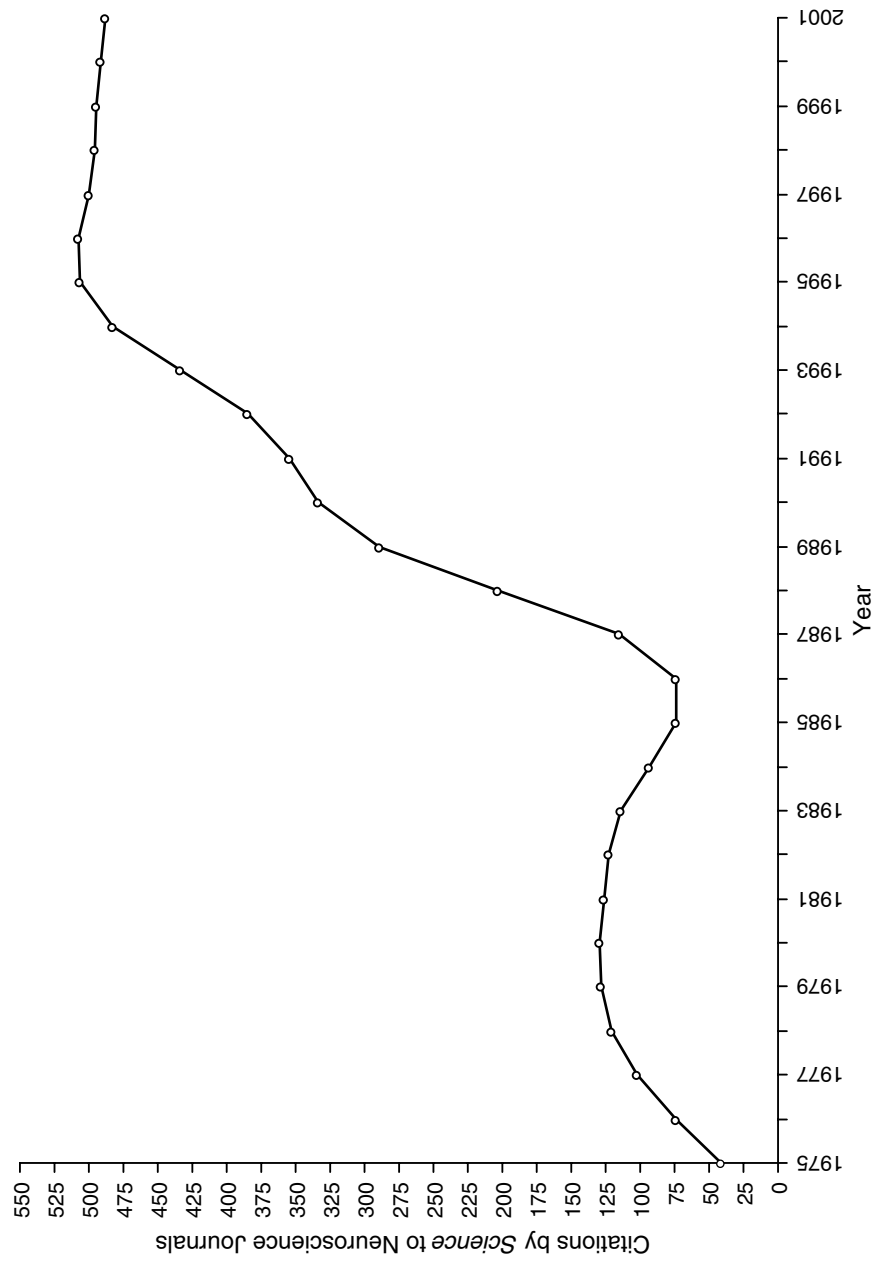


Figure 5. Annual membership in the Society for Neuroscience. A smoothing function was used to transform the raw data.

Thus, much of the growth in neuroscience seems to be taking place outside of psychology. Neuroscience is typically considered both a behavioral and a biological science, but at this point, neuroscience seems to be located more centrally in biology than in psychology. In some sense, neuroscience may even constitute its own independent scientific discipline.

## DISCUSSION

Together, these four trends tell a story about the recent history of psychological science. Overall, the findings reflect the decline and virtual death of psychoanalysis within scientific psychology; the gradual decline of behavioral psychology; the sharp ascent and, perhaps, leveling-off, of cognitive psychology; and the beginning of neuroscientific psychology's rise. These findings are further supported by the founding dates of the four journals from each school (see Table 1). The psychoanalytic journals had the earliest founding dates (median = 1943), followed by the behavioral journals (median = 1965), the cognitive journals (median = 1973) and, most recently, the neuroscientific journals (median = 1978). Furthermore, although there have been few if any new journals introduced which are devoted to the study of psychoanalysis or behaviorism, there has been an explosion of new journals in cognitive psychology, cognitive-neuroscience, and neuroscience.

In fact, the emergence of the inter-disciplinary area of cognitive neuroscience suggests another indicator of neuroscience's rise to prominence. Cognitive neuroscience has become an important part of psychology, as indicated by the publication of the *Handbook of Cognitive Neuroscience* in 1984, the creation of the *Journal of Cognitive Neuroscience* in 1989, and the establishment of the *Cognitive Neuroscience Society* in 1994. Several other areas of psychology also have recently expanded to incorporate a neuroscientific perspective. There has been a proliferation of conferences, books, journals, and societies centered around "affective neuroscience," "social neuroscience," "behavioral neuroscience," "psychoneuroimmunology," and "developmental neuroscience." This trend of interdisciplinary overlap may be repeating history: During the 1970s and 1980s, when cognitive psychology reached what may have been its peak in prominence, "social cognition," "cognitive development," and other cognition-focused approaches provided a guiding framework for much of the research in psychological science. In some sense, the rise and fall of interdisciplinary topics may be a harbinger of the dominant, or at least the newly emergent, paradigm in the field. However, we must also be cautious in our interpretations of such non-empirically based data; as Miller and Keller (2000) have noted,

psychologists may use terminology from neuroscience, the currently "hot" area, to "repackage their phenomena to sound biological [due to] political pressures" (p. 213), rather than to find useful or meaningful interconnections or areas of overlaps between neuroscience and other psychological schools.

Nonetheless, it is clear that the brain has become a common currency for discussing psychological ideas, and this transgresses virtually all areas of the field. Psychologists are now asking questions such as, "Are the only acceptable concepts those with biological reality?" (Kimble, 2000, p. 208); and "Can there be any doubt of the increasing biologization of psychology?" (Slife & Burchfield, 2002, p. 250). Such questions may ring a familiar chord to many psychologists: Similar questions were asked several decades ago, with the words "observable behaviors" taking the place of "biology".

In fact, if we examine any single psychological phenomenon, we can see that whichever school is prominent determines how it is studied. For example, the emotional phenomenon of fear is currently viewed according to models that specify its neuroanatomy and neurochemistry, and which make use of magnetic resonance imaging (MRI), brain lesioned patients and animals, and single-cell recording in rats (e.g., Amaral, 2002; Damasio, 1999; Davidson, 2001; LeDoux, 1996; Panksepp, 1999). However, in the early part of the century, when psychoanalysis was the dominant school of thought, fear was studied as displaced anxiety, typically due to repressed sexuality, as in the case of Freud's famous interpretation of the phobic "Little Hans" (Freud, 1909/1955). Later in the century, fear was reduced to a behavioral response to conditioned stimuli, and Little Hans' phobia was reinterpreted in this light (Wolpe & Rachman, 1960). By the 1970s and '80s, fear became seen as a cognitive appraisal of threat and, in fact, all emotions were viewed as cognitions paired with undifferentiated arousal (Schachter & Singer, 1962). Thus, the study of fear provides an example of how trends in the field influence the study of important psychological phenomena and shape the way scientific research is conducted.

However, despite the fact that neuroscience shows some signs of influencing the study of certain psychological phenomena, it is clearly more prominent outside the domain of psychology. In some sense, the field of neuroscience may be at a crossroads: Will it remain within the psychological sciences, will it align itself even more strongly with biological science, or will it break its allegiance to either discipline and form its own field? In our opinion, psychology should not let neuroscience slip away, perhaps taking with it a host of topics formerly studied by psychologists. Thus far, even the psychologists who are increasingly oriented towards understanding the relevant neural mechanisms of the topics they study (e.g., emotion, attention, memory) have remained centrally located within psychology.

Yet, the integration of the neuroscientific perspective within psychology cannot be taken for granted. Indeed, at times it would seem that many psychologists must be reminded that "Just because biological factors are *necessary* to a person's behavior does not mean these factors are a complete and *sufficient* cause or explanation of this behavior; other conditions may be necessary for the particular behavior to occur" (Miller & Keller, 2000, p. 252). Just as Plomin (1997) has urged psychologists not to lose DNA to the molecular geneticists, Squire (1997) has recently called on psychologists to take active steps to strengthen links between psychology and neuroscience. Kimble (2000) noted that "Behavioral concepts tell biological psychology what to look for in experiments [and] the details of [biological] data often suggest refinements of the behavioral concepts, thus initiating a new cycle of behavioral and biological investigation" (p. 209). Kosslyn et al. (2002) recently argued that, "linking psychology to biology in a way that respects individual differences may have profound implications for psychotherapy" (p. 349). Even those who advocate reducing psychology to neuroscience have argued that "neuroscience needs psychology because it needs to know what the system does" (Churchland, 1986, p. 373).

On the other hand, some researchers have questioned whether higher level sciences like psychology and lower level sciences like neuroscience can "offer any useful guidance to each other" (p. 78) and have suggested that psychology and neuroscience "must simply pursue their own problems in their own way" (Bechtel, 1988, p. 78). As Laird Cermak, former editor of *Neuropsychology*, pointed out, "Neuropsychology is a discipline for which the boundaries are still being defined—it is still inventing itself" (APA Monitor, 1996). We anticipate that the next few years will see many "border disputes" between psychology and other disciplines to determine the extent to which neuroscientists view psychology as their primary academic home. E. O. Wilson (1999) has even suggested that psychology (as well as other social sciences) may be at a critical juncture, which will determine whether it degenerates into a post-modernist free-for-all or evolves into a fully-fledged natural science. Although we would not cast psychology's prospects in terms of such extremes, we do believe that psychologists must work harder to integrate neuroscience within the field.

Writing to the general psychological community, Squire (1997) argued, "As the next century approaches, one should celebrate and encourage the increasing partnership between psychology and neuroscience." We agree, and our finding of a recent rise in attention to the neuroscientific school may be the first empirical evidence for the emergence of such a partnership. In our opinion, the brain and behavior need to be studied in tandem, and psychology should not let neuroscience slip away, nor should we let neuroscience become the single prevailing perspective in the field.

As Miller and Keller (2000) recently argued, “Researchers are learning a great deal about the biology of fear—and the psychology of fear—from studies of the amygdala (e.g., Lang, Davis, & Öhman, 2000), but this does not mean that fear *is* activity in the amygdala. That is simply not the meaning of the term. ‘Fear’ is not reducible to biology” (p. 212). We strongly agree with this sentiment: Important psychological phenomena cannot be completely explained from the perspective of any single school. As Zuckerman (1999) noted, “One thing that both behavioral and post-Freudian psychoanalytic theories had in common was the conviction that learning and life experiences alone could account for all disorders” (p. 413). Fear cannot be reduced to amygdala activity, nor to repressed castration anxiety, nor to a conditioned response to a stimulus, nor to a cognitive appraisal of threat. Fear may be all of these things, and it can best be understood when various ideas of the different schools of thought are viewed as complementary, rather than antagonistic.

### Implications for the Progress of Psychology as a Science

Although our analyses are neutral with regard to different views of scientific progress, several perspectives within the history and philosophy of science may aid in interpreting our empirical findings. First, from a Kuhnian perspective, our findings point to the cognitive school as the most recent in a succession of dominant paradigms. But other forms of evidence are required before a Kuhnian revolution can be declared; Kuhn’s emphasis on the socialization process within science would call for evidence that, for example, the textbooks of scientific psychology have become primarily cognitive in orientation.

However, given debates about whether psychology has even reached the paradigmatic stage of science (e.g., Briskman, 1972; Leahey, 1991; Schultz, 1981; Warren, 1971; Watson, 1977), the proper question is not whether cognitive psychology is a newly dominant paradigm arising from the revolutionary ashes of a prior dominant paradigm, but which of the various schools is most likely to gain a transcendent status and introduce the longawaited paradigmatic stage of scientific psychology’s development. Viewed within a multiparadigmatic framework, cognitive psychology may be the most likely of the existing schools to move psychology to the Kuhnian stage of normal science. However, the apparent emergence of the neuroscientific school allows us to question how long the cognitive school will remain dominant, and it is possible that within the next decade the two schools will directly compete for transcendence.

Viewed from the Lakatosian perspective, our findings imply that the cognitive school has attained prominence because it has been a progressive

research program; that is, it has yielded new hypotheses and findings. The Lakatosian perspective also implies that the current surge in cognitive psychology need not be interpreted as a scientific revolution, but could represent a revitalization of a perspective that was progressive in the early days of psychology (e.g., Wundt and James both emphasized the role of mental activity), degenerative during the middle of the 20th century, and now revived to prominence. Similarly, the currently lower prominence of the behavioral school may be seen as only a temporary slump, leaving open the possibility that the behavioral research program may once again rise to prominence in the field. Finally, the Lakatosian view implies that the four schools can inform each other; that is, they are not strictly “incommensurable” as Kuhn would have argued. Consistent with this view, there does seem to be productive exchange among the various schools of psychology. As noted earlier, cognitive neuroscience represents a fusion of ideas from the cognitive and neuroscientific schools, suggesting that these two perspectives may be able to coexist fruitfully. More generally, psychology appears to be coagulating around broader scientific orientations that cut across traditional fields of study (e.g., cognitive science combines psychology, linguistics, computer science, philosophy, etc.). At the same time, psychology also seems to be dividing into increasingly specialized camps (e.g., visual attention; stereotypes; decision making), which may eventually render broad classifications such as “cognitive psychology” obsolete. This last possibility raises a troubling question: Is psychology a splintered field, or one moving toward an overarching orientation that will tie together its diverse threads?

From Latour’s perspective, cognitive psychology may have become prominent because its scientific products were effectively “publicized” to the rest of the field. This account may also be used to explain the newfound rise of neuroscience, a field that has been widely discussed by scientists, extensively covered in the popular media, and further promoted by an act of Congress (the congressional resolution labeling the 1990s as the “Decade of the Brain”).

From the perspective that prominence is based on passing fads and constantly shifting trends (Christensen-Szalanski & Beach, 1984), the rise of cognitive psychology may constitute an ephemeral blip in the history of psychology, rather than a long-term shift in the orientation of the field. Clearly, though, the fact that the cognitive perspective has sustained its prominence for more than two decades argues against this idea. Thus, although we recognize that there are paths other than scientific merit to achieving prominence, we believe that the robust scientific trends documented in the present study reflect more than just fad or fashion. It remains to be seen whether the emerging neuroscientific perspective will have the

same sustained influence as the cognitive perspective, and work its way into the conceptual and methodological infrastructure of the field.

## Limitations

After we published our findings on trends in the field (Robins et al., 1999), a series of published commentaries on our article raised a number of concerns, both methodological and conceptual. Not surprisingly, the question of what's hot and what's not sparks contentious debate. In fact, the wide range of responses elicited by our findings supported our initial contention that speculating about trends is a popular pastime among academics.

### *Methodological Issues*

Are our empirical analyses a reasonable and feasible approach to informing the widespread speculation within the field about scientific trends? We believe they are, and we had hoped that our original article would serve as a clarion call for a more empirically informed approach to the history of psychology. Several commentators on our original article, however, expressed objections to the specific methods we used in conducting these analyses. It was suggested, for example, that we expand our keyword searches (Friman, Allen, Kerwin, & Larzelere, 2000). We agree that these analyses could not detect all of the articles related to each school. For example, the keyword "cognit#" will not detect all cognitive articles because even articles that are central to the cognitive perspective may not have "cognit#" in their title, list of keywords, or abstract. This issue is even more pertinent for our dissertation analyses, which relied on searches of subject or title words only, omitting the abstract. Moreover, as we have noted previously (Robins & Craik, 1994), even the four broad schools of thought do not exhaust the research perspectives found in psychology. Thus, articles from an evolutionary, behavioral genetic, or social constructionist perspective are unlikely to include any of our keywords. Finally, our keyword indices may not identify psychological research that is centered on specific content domains (e.g., self-esteem, emotion regulation) and/or applied issues (e.g., industrial psychology, sports psychology). Given these points we would not expect our keywords to capture the full range of articles published in the flagship publications.

Of course, there is no end to the additional analyses that could be performed or the additional data that could be collected. Thus, we aimed to circumvent several potential limitations through the use of a multi-method approach. Specifically, we replicated our findings across three measures of prominence, and we explored several sets of keywords and journals (see

Robins et al., 1999). The three measures paint strikingly similar portraits of the recent history of psychology, indicating that the trends are not dependent on any particular measure, journal, or keyword. Thus, to question our findings, one would need to (a) identify flaws in all three of our measures *and* (b) explain why these three flawed measures all point to the same trends.

Furthermore, two of those who commented on our original articles conducted additional analyses that converged with our results. Tagler's (2000) analysis of prominent psychologists supports the dominance of the cognitive school over the behaviorist school in recent years. He found, for example, that B.F. Skinner was rated the most influential psychologist in 1966 and 1981, but by 1998 had dropped to 7th most-influential and been replaced by cognitively-oriented psychologists. Gibson (2000) reached a similar conclusion based on his analysis of APA presidential speeches. He also replicated our finding that the 1970s was the specific decade in which the cognitive school overtook behaviorism in prominence. Both of these studies thus reveal the same trends as our three sets of analyses, and of course neither relied on our choice of keywords, methods, or journals.

One thing that we found striking about the commentaries to our articles, as well as the feedback we received from reviewers and other readers, was that most of these scientists had numerous suggestions for additional analyses but none took their own advice. We find it surprising that scientists seem to leave their "science hats" at the door when it comes to evaluating and understanding trends of prominence in science. One point that we hope to make with this chapter is that the methods we used are available to any researcher who wishes to replicate or dispute our findings, or to uncover trends in other areas. Most of our analyses can be conducted quickly and easily, using publicly accessible databases. We encourage other researchers to test contrary claims and to use alternative methods. Behaviorist-oriented researchers seemed the most reluctant to accept our findings, so we would be interested to learn what set of specific keywords would successfully reverse the empirical trends we report for the behavioral and cognitive schools. At this point, however, the accumulated empirical evidence supports our findings (including the additional analyses reported by Gibson and Tagler).

Prominence can be assessed through a wide variety of indices, so, in some ways, our analyses may serve as an example of how to empirically quantify prominence. We urge other researchers to use these methods to assess trends in other fields of science, trends within particular areas of psychology, or to improve upon our analyses by expanding or changing the domains of journals and subject-matter indicators that we used. One interesting undertaking, of relevance to the present volume, would be to chart

empirically the pattern of recurring ideas within the field of psychology. The key point is that beliefs about how the field is changing are not always supported empirically, and claims about trends need to be substantiated with data.

*Conceptual issues*

Leigland (2000) critiqued our undifferentiated view of the behavioral school, and called for a historical analysis that takes into account the complexities of behaviorism and its intellectual offspring. This is an important point; each school of thought examined in our analyses may well have contributed to other areas, which have now become more prominent than the progenitor. For example, it could be argued that behavioral neuroscience is an offshoot of behaviorism. Our own interest was in charting trends at a macro level, but we hope that others will conduct more fine-grained empirical analyses and use the complementary methods of scholarly historical analysis to tease apart the trends among interrelated areas. Important issues regarding the multiple voices within behaviorism, for example, may be more properly treated within the intellectual history of psychology (Kendler, 1987).

Another limitation is our focus on four, and only four, schools of psychology. The substantive domains covered by these four schools do not comprise most of our field's scientific activity. As we have noted elsewhere (Robins, & Craik, 1994), much else is underway within contemporary psychology. We have simply focused upon an analysis of four traditions that have received speculative comparative discussion in the research literature, in textbooks on the history of psychology, and in informal 'shop talk' at research centers.

Finally, one commentator suggested that our empirical research was biased by our particular theoretical orientation. However, we are rather eclectic psychologists with broad interests in affective (Tracy), developmental (Robins), ecological (Gosling), and social-personality (all) psychology. We set out unaware of having any particular 'axe to grind', and, in short, our bias is not for or against a particular school, but against speculating about trends without empirically documenting them.

## WHAT LIES DOWN THE ROAD FOR PSYCHOLOGICAL SCIENCE?

It is worth concluding on a simple point: Scientific understanding accrues from the cumulative findings of a program of studies. No single study can address all research questions and methodological limitations. We are

arguing for treating the history of psychology as an empirical research area that can yield cumulative, quantitative, and increasingly sophisticated and differentiated insights. That is, we do not envision single study, yes-or-no answers about trends in the field, but rather we see incremental progress toward understanding the development of the field. We view our study as part of a broader scientific enterprise, the goal of which is to document replicable trends using empirical indicators and thus move beyond polemics. If psychology is indeed at a crossroads that will determine its future as a science, as E. O. Wilson recently argued (Wilson, 1999), then it is incumbent on the field to understand its history.

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