Chapter 10. Career Training

Despite the impressive inventory of family-background variables, some other developmental factors must participate as well, and certainly career training is among them. Most of the chapter concentrates on various aspects of formal education, including the highest degree obtained, the level of scholastic performance, the rate of educational progress, the prestige of the instructional institutions, and, most critical, the distinction of the mentors. The chapter ends with a look at the consequences of self-education and professional marginality – two means of obtaining an expertise that departs from mainstream training in the field.

"Trials and Tribulations" may not be confined to the home.
Although much of a child's early years are spent in the home, as children get older their lives become ever more dominated by school.
This experience, too, may be the source of either happiness or unhappiness.
Galton's own life amply illustrates the latter possibility.
Given these unfortunate experiences, it seems fitting that Galton (1874) should devote the fourth and last chapter of *English Men of Science* to education.
In doing so, he became the first behavioral scientist to investigate how formal education contributes to the attainment of scientific distinction.
But, of course, he was by no means the last to research this topic.
This extensive literature will be reviewed below.
Afterward we will examine two closely related topics – self-education and professional marginality – that were not directly addressed in Galton's survey.

FORMAL EDUCATION

Einstein was quite explicit when he expressed his personal attitudes toward his educational experiences. For instance, he once remarked that

> it is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry; for this delicate little plant, aside from stimulation, stands mostly in the need of freedom; without this it goes to wreck and ruin without fail. It is a very grave mistake to think that the enjoyment of seeing and searching can be promoted by means of coercion and a sense of duty. (quoted in Schlipp, 1951, p. 17).

His opinions were especially negative about the procedures most commonly used to test the student's mastery of the material:

> One had to cram all this stuff into one's mind for the examinations, whether one liked it or not. This coercion had such a deterring effect on me that, after I passed the final examination, I found the consideration of any scientific problems distasteful to me for an entire year. (quoted in Hoffman, 1972, p. 31).

Given Einstein's bad attitude, it comes as no surprise that his teachers were not very impressed. For example, one of his university professors, Hermann Minkowski, admitted that Einstein's later scientific achievements "came as a tremendous surprise … for in his student days Einstein had been a lazy dog. He never bothered about mathematics at all" (quoted in Seelig, 1958, p. 28).

Another exasperated professor, Heinrich Weber, told Einstein directly, after years of frustration: "You're a clever fellow! But you have one fault. You won't let anyone tell you a thing. You won't let anyone tell you a thing" (quoted in Hoffman, 1972, p. 32).

Many great figures in the history of psychology have expressed similar opinions. For instance, James McKeen Cattell (1910), in his study of 1,000 distinguished American scientists, once ventured that

> our educational methods are thus becoming more completely standardized or conventionalized. The two men who stood first on the list of 1903, Simon Newcomb and William James, had neither the regular college nor the regular university education. Whether this was favorable or harmful to their genius is unknown; but it is probable that our present educational methods do not favor individuality and its early expression. (p. 643)

Charles Darwin (1892/1958) provided a specific anecdote illustrating the stifling effects of formal education when he complained that

> during my second year at Edinburgh I attended Jameson's lectures on Geology and Zoology, but they were incredibly dull. The sole effect they produced on me was the determination never as long as I lived to read a book on Geology, or in any way to study the science. (p. 15)

These reactions are not atypical. Among the 87 scientists who responded to Galton's (1874, p. 237) question about their educational experiences,

- 11% complained about "want of system and bad teaching" while another
- 37% expressed dissatisfaction with the "narrow education" they had received.
- An especially common complaint was that the curriculum stressed useless subjects, like Latin and Greek, while being largely devoid of the natural sciences and mathematics.
- All told, 57% had some kind of complaint.
- Of the remaining minority, many praised experiences somewhat peripheral to their formal training, such as "home teaching and encouragement."
- Only 10 of 87 survey responses could be placed in the category "education praised throughout, nor nearly so."
- Moreover, those with more positive experiences came from institutions that provided what Einstein considered most basic to a good education. Typical praise in this vein are "Freedom to follow my own inclinations, and to choose my own subjects of study, or the reverse," "The great proportion of time left free to do as I liked, unwatched and uncontrolled," and "Unusual degree of freedom" (p. 254).

Yet these are mere opinions, not facts. Hence, to determine the impact of formal education on the emergence of great psychologists, it is necessary to look at the objective reality, not the subjective perception of that reality. Below the following five issues will be examined:

1. the highest degree obtained,
2. the quality of scholastic performance,
3. the degree of accelerated progress,
4. the prestige of the educational institution, and
5. the influence of distinguished mentors.

Highest Degree

It is commonly assumed that a doctoral degree is essential for eventual scientific success. Yet Einstein's own educational history proves otherwise.

His subsequent difficulties getting a higher degree later led him to tell a friend "I shall not become a Ph.D. ... The whole comedy has become a bore to me" (quoted in Hoffman, 1972, p. 55).

While not nearly so dramatic, similar episodes are narrated in the history of psychology.

James Rowland Angell is a favorite case, because he "studied both abroad and under James at Harvard but never bothered to finish his PhD.

To put this issue in proper context, let us begin by looking at more inclusive samples of eminent personalities.

- Havelock Ellis (1926) reported that only 53% of his British geniuses could claim any university training whatsoever. Although one might think that this same statistic would not be expected in more recent samples, that turns out not to be the case.
- An inquiry confined to 314 modern luminaries obtained the following breakdown: 19% graduate or professional degree, 4% some graduate or professional study, 19% college graduate, 9% some college attendance, 23% high school graduate, 11% some high school, and 15% 8th grade or less (Goertzel, Goertzel, & Goertzel, 1978).

By these figures, a higher degree is not essential to the attainment of distinction.

Of course, these statistics lump together a wide array of pathways to eminence – revolutionaries, assassins, painters, poets, etc. – in which higher education may have the most minimal relevance.

Research has shown, in fact, that the expected level of formal education attained varies according to the domain of achievement.

One investigation directly compared eminent scientists with eminent writers, and found that those in the former group were much more likely to have university training, by a differential of 73% to 65% (Raskin, 1936).

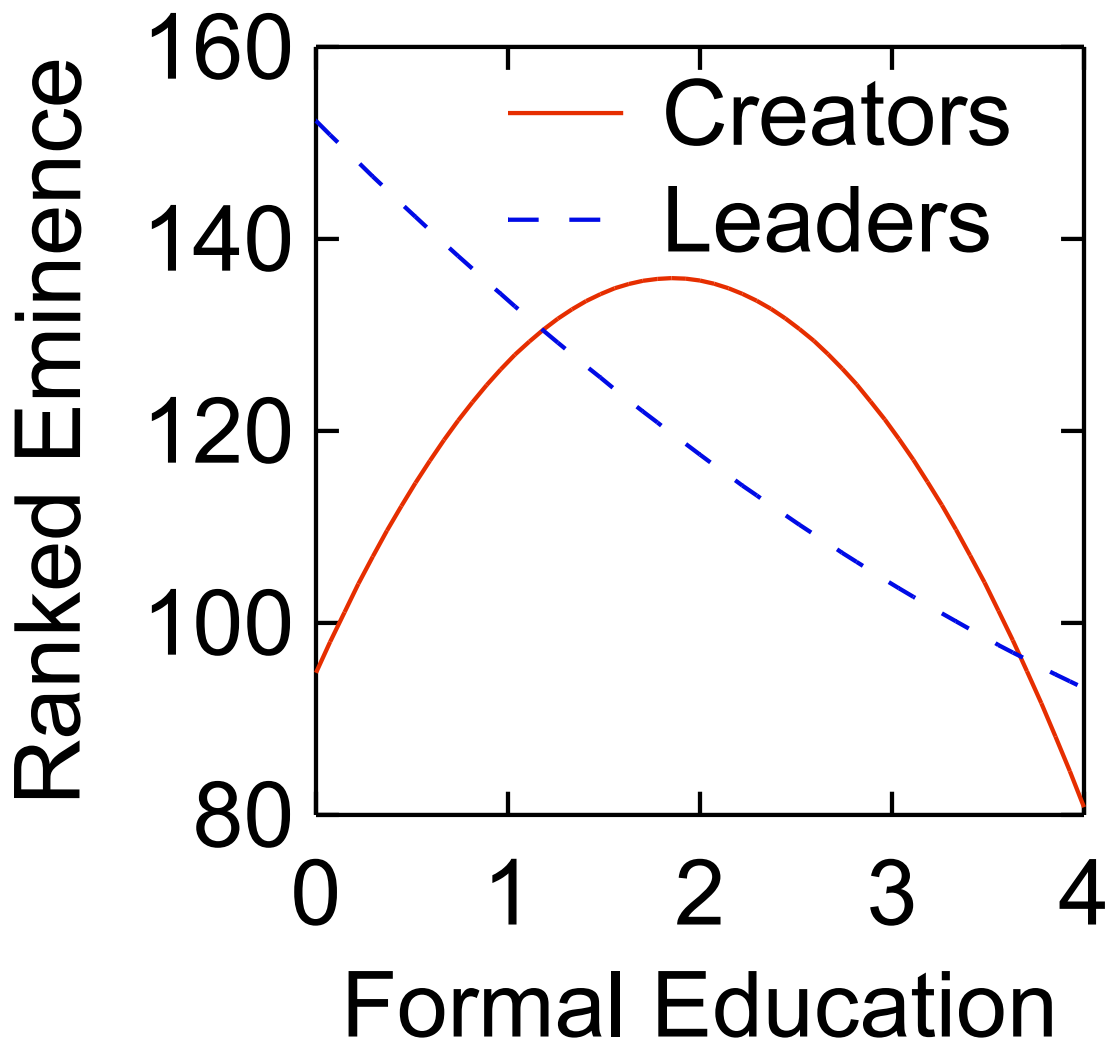
Likewise, a secondary analysis of the 314 illustrious personalities described above revealed that the scientists and psychiatrists tended to acquire much more formal education than most other groups, especially in comparison to athletes, labor leaders, entrepreneurs, and mystics or psychics (Simonton, 1986a).

Interestingly, Galton (1874) reported that fully a third of his eminent English scientists also lacked any university-level instruction.

Although it may be possible to attain distinction, even as a scientist, without a college or university degree, one still might wonder whether any advantage accrues to someone who has gained the privilege of adding initials like BA or PhD to their full name.

Two secondary analyses directly examined this issue (Simonton, 1976a, 1983b, 1984d).

- The first took the 301 geniuses in Cox's (1926), coding the subjects for the level of formal education they attained, using the extensive biographical data that she published in her tome (Simonton, 1976a). The study then gauged how her assessment of differential eminence (derived from J. M. Cattell's 1904 study) depended on this new measure. The 192 creators were treated separately from the 109 leaders in her sample. The result is shown in Figure 10.1.
- The other secondary analysis used the 314 illustrious moderns already mentioned twice above (Simonton, 1984d). Four groups: miscellaneous celebrities (positive monotonic), leadership (curvilinear), arts and humanities (curvilinear), and science (curvilinear).



Whether this conclusion can be extended to future psychologists is a difficult problem. The difficulty is simply that it is now rather rare for psychologists *not* to have a doctoral degree.

- Of 161 deceased individuals who earned obituaries in the *American Psychologist* between 1979 and 1990, fully 97% had earned a PhD (Kinnier, Metha, Buki, & Rawa, 1994).
- Another study of 69 eminent American psychologists active between 1879 and 1967 found that 87% had the same status (Simonton, 1992b). Moreover, this percentage might be increased to 90% it is considered that two of the figures had actually written their doctoral dissertations, but without having them accepted.

Scholastic Performance

Marcel Grossmann's was a brilliant mathematician who earned a PhD at age 24, and at age 29 secured a mathematics professorship at Zurich Technological Institute.

- Yet Grossmann is not nearly so well known as his university classmate and friend, Einstein.
- Indeed, Grossmann's fame is almost entirely confined to his having helped Einstein overcome his academic deficiencies.
    - In the first place, it was Grossmann's meticulously taken lecture notes that enabled Einstein to pass those examinations he so much hated.
    - Secondly, when Einstein began to realize that his mathematical deficiencies were preventing him from developing his theoretical ideas, he found in Grossmann a willing and extremely capable collaborator.
- It is as Einstein's mathematical handyman in the development of the general theory of relativity that Grossmann is best known today.

So clearly, Einstein's academic mediocrity was by no means a major deficit, nor was Grossmann's scholastic proficiency a major asset.

- Likewise in the history of psychology, the scholastic first may end up last, and the last end up first. Galton's academic struggles have already been noted, but he is far from the only instance.
- Charles Darwin was another – a mediocre student throughout his years of education.
- The behaviorist J. B. Watson (1936) said of his own grammar school days that "I was lazy, somewhat insubordinate, and, so far as I know, never made above a passing grade" (p. 271).
- Alfred Adler's mathematics performance was so miserable that he was obliged to repeat the course, and Adler's father was advised by his teacher to put the boy in an apprenticeship rather than waste further education on him.
- Many notables had a particularly hard time in their university studies. D. O. Hebb, the distinguished physiological psychologist, graduated from college with a grade point average only a hair's breadth from failing.
- The psychiatrist Henry Stack Sullivan was suspended from college after failing his classes.
- Humanistic psychologist Abraham Maslow followed up a mediocre performance in high school with even more deplorable grades in college, and ended up on academic probation.
- When Claude Bernard, the great physiologist, took an exam to compete for an internship, he ranked 26th out of the 29 who passed.

A comprehensive inventory of once poor students who later propelled themselves into the history of psychology would be very long indeed.

All of these sad cases be what they may, there exists an ample number of major figures who could claim exceptional academic prowess.

- Sigmund Freud was a brilliant student, graduating summa cum laude from the gymnasium at age 17.
- Psychiatrist Karen Horney was an A student in both primary and secondary education, and clinical psychologist Lightner Witmer was a valedictorian.
- The philosopher Auguste Comte had attained one of the top spots in the examinations required to enter the École Polytechnique, but at 15 was too young to be granted admission.
- British luminaries John Locke, James Mill, and Edward Titchener had all won scholarships to attend college.
- Humanistic psychologist Carl Rogers belonged to two honor fraternities as an undergraduate.
- R. B. Cattell graduated from London University with honors, while both Alexander Bain and Donald T. Campbell stood at the top of their respective graduating classes.
- The Gestalt founder Max Wertheimer earned his PhD with highest honors.

Furthermore, there are plenty examples of "late bloomers" who may not have done well at first, but performed remarkably well once some life event changed their attitude about the significance of getting

a good education. Psychology's founder, Wilhelm Wundt, evinced such a dramatic conversion shortly after his father died, and earned his medical degree *summa cum laude*.

So, it is even possible to formulate an empirically sound assertion on the relation between scholastic success and later greatness as a scientist?

In the main, the empirical literature suggests a somewhat ambiguous connection.

- On the one hand, in an inquiry that repeated Galton's (1874) selection procedure on a more recent sample, Fellows of the Royal Society were found to have generally unimpressive undergraduate records, records that were certainly no better than scientists who failed to be so honored (Hudson, 1958).
- Nonetheless, other studies have shown that indicators undergraduate and graduate performance display modest but positive correlations with a scientist's productivity, citation rate, and eventual eminence (e.g., Chambers, 1964; Segel, Busse, & Mansfield, 1980). In particular, the more distinguished physical and biological scientists tend to boast higher grade point averages, win more honors and prizes, and receive more scholarships and fellowships.
- Is this also true for great psychologists? One might think the answer would be negative. Besides the anecdotes given earlier, some research has shown that future psychologists do not take academics as seriously as other scientists do (Chambers, 1964). For instance, as undergraduates psychologists have lower grade point averages than do chemists even though the latter had to take courses that were far more rigorous academically.

Even so, some evidence has appeared showing that scholastic prowess bears a positive association with the future success of psychologists (Rodgers & Maranto, 1989).

- The sample consisted of 485 members of the American Psychological Association who were granted doctoral degrees between 1966 and 1976.
- For each participant the researchers determined
    - the total number of citations their publications received by others and
    - the number of journal articles published in the first 6 years after the PhD (weighted according to quality).
- For each was also assessed
    - how selective was the institution from which they earned their undergraduate degree,
    - whether the participant graduated with departmental honors, and
    - whether he or she graduated Phi Beta Kappa. For the most part, the two criteria of scientific impact correlated positively with the three indicators of scholastic performance.
- Four out of the six correlations are statistically significant.
- Specifically, the citation measure correlates .21 with Phi Beta Kappa, while the productivity measure correlates .16 with selectivity, .24 with Phi Beta Kappa, and .18 with departmental honors.
- The consistent association with the receipt of a Phi Beta Kappa key is especially distinctive, because this honor is bestowed upon US undergraduates who do very well in a broad range of scholastic subjects.

If these results can be generalized, mutatis mutandis, to great psychologists in other nations, then it would seem that scholastic performance should provide a weak but still positive sign of later professional success.

> After all, productivity and influence in the first half-dozen years of a psychologist's career is an excellent predictor of lifetime output and impact.
>
> At the same time, with correlations in the upper teens and lower 20s, there should be ample latitude for exceptions to the rule, such as some of those mentioned earlier in this section.

Accelerated Progress

Grade point averages and academic honors provide one way of gauging a psychologist's scholastic performance, yet they do not exhaust the possible approaches.

An alternative is to determine how rapidly an individual gets through the educational system.

Judging from what was reviewed in chapter 6 – especially Cox's (1926) study of 301 genius – those individuals who claim decidedly superior information-processing skills should be able to master educational materials at an accelerated pace.

This accelerated progress should show up in the precocious age at which the great psychologist advances through the key points in the educational sequence.

Such educational acceleration has already been empirically demonstrated for famous scientists.

- In the first place, more creative scientists tend to graduate from high school at an earlier age than is the norm (C. W. Taylor & Ellison, 1967).
- Illustrious scientists are also more likely to complete their undergraduate education at a younger age (J. M. Cattell, 1906; Chambers, 1964; Poffenberger, 1930).
- Roe's (1953a) distinguished biologists, for example, received their baccalaureate degrees at the mean age of 21.8, while her notable physicists obtained their degrees at the mean of 20.9.
- But most striking are the precocious ages at which great scientists receive their doctoral degrees (Helson & Crutchfield, 1970; Roe, 1953a; Zuckerman, 1977).
    - The average age at PhD for Roe's (1953a) biologists was 26.0, for her physicists 24.6.
    - The more distinguished the scientist, the greater the degree of doctoral acceleration.
    - Among US scientists elected to membership in the National Academy of Sciences average around 26.0, whereas those with the Nobel prize average around 24.8, both figures contrasting with the mean of 29.5 for the typical doctorate (Zuckerman, 1977).

Curiously, even Albert Einstein's academic progress could not be considered too retarded by these standards. Despite spending many years trying to get a doctoral dissertation approved, he finally succeeded at age 26, putting him in the same league as the NAS members. And if his first thesis had been signed off, Einstein would have been 23, well within the Nobel laureate class.

Many great psychologists seem to fall into the same pattern of accelerated progress.

- Thus, J. M. Cattell entered college before his 16th birthday, while R. B. Cattell graduated with honors from college at age 19.
- J. B. Watson received his PhD at age 25 (under the PhD-less J. R. Angell), the youngest to ever do so at the University of Chicago at that time. Actually, Watson was by no means exceptional.
- Other PhDs at age 25 include G. Allport, S. Asch, J. R. Anderson, L. Berkowitz, C. Bühler, K. Bühler, E. Du Bois-Reymond, J. Dewey, S. Fernberger, M. S. Gazzaniga, H. Harlow, S. Hecht, H. Henning, V. Henri, O. Külpe, I. Lorge, R. D. Luce, P. Meehl, A. von Meinong, H. O. Mowrer, F. Nietzsche, A. Schopenhauer, E. Titchener, and L. Witmer.
- Moreover, Table 10.1 gives cases of more dramatic precocity – doctorates at 24 or younger.

Table 10.1

Precocious Doctorates in the History of Psychology

Age	Individuals
24	**B. G. Anan'ev, R. Arnheim, B. M. Bass, G. Békésy, S. L. Bem, E. Brunswik, R. B. Cattell, C. N. Cofer, L. Cronbach, D. Elkind, H. B. English, W. K. Estes, H. J. Eysenck, R. M. Gagné, R. A. Gardner, P. Gassendi, K. F. Gauss, A. Gelb, J. Gibson, C. H. Graham, M. P. Haggard, R. J. Havigurst, F. Heider, H. T. Himmelweit, C. I. Hovland, W. S. Hunter, H. Kelman, D. Krech, K. Lashley, K. Lewin, E. A. Locke, K. Marbe, D. Marquis, D. C. McClelland, C. T. Morgan, W. B. Pillsbury, A. Pilzecker, E. H. Schein, H. Schlosberg, F. Schumann, R. R. Sears, N. W. Stock, E. L. Thorndike, F. M Urban, M. Verworn, M. S. Viteles, H. Werner, M. Wertheimer, and G. Whipple.**
23	**G. Allport, S. Bem, F. Boas, W. J. Crozier, H. Ebbinghaus, L. Festinger, W. Hellpach, E. M. von Hornbostel, J. Jastrow, C. H. Judd, K. Koffka, F. Krüger, M. E. Lamb, T. Lipps, K. Marx, M. F. Meyer, W. Moede, G. E. Müller, Z. A. Piotrowski, W. Poppelreuter, J. Royce, J. von Neumann, R. Shank, M. F. Washburn, H. A. Witkin, T. Young, and K. Zenner.**
22	**J. L. Agassiz, A. Anastasi, V. Benussi, M. Dessoir, H. De Vries, H. A. E. Driesch, E. Fromm, E. Husserl, A. Jost, D. Katz, G. O. Klemm, W. Köhler, E. Kris, E. Mach, H. Münsterberg, W. Nagel, J. Piaget, W. Stern, D. N. Uznadze, H. Vaihinger, and F. L. Wells.**
21	**G. W. Leibniz, J. P. Müller, H. Pièron, W. T. Preyer, and W. Wirth.**
20	**P. Feuerbach, G. W. F. Hegel, C. Stumpf, and M. de Unamuno.**
19	**A. E. Michotte.**
18	**N. Wiener.**

***Note*. The PhDs were received in several fields besides psychology.**

To be sure, it is always possible to cite counterexamples. Narziss Kaspar Ach, Donald T. Campbell, Wilhelm Dilthey, and George Stratton were 31, Mary Calkins and Harvey Carr 32, John Baird, Henry Goddard, and Henry Murray 33, Frank Angell, G. S. Hall, Clark Hull, and Aleksander Luria 34, Harvey C. Lehman and Carl Murchison 36, Alfred Binet and Eric Lennenberg 37, Florence Goodenough 38, Charles Spearman 41, and Immanuel Kant 51.

Yet, in many of these cases there were extenuating circumstances.

Sometimes, for instance, the doctorate was received after first getting another advanced degree, such as an MD.

In truth, numerous empirical studies show that, on the average, educational acceleration is the norm for highly influential psychologists (Hirschberg & Itkin, 1978).

- The eminent psychologists in Roe's (1953a) sample earned their bachelors degrees around age 21.4, and their doctorates around 25.8 (the corresponding figures for the social scientists as a whole are 21.8 and 26.8, respectively).
- Illustrious contributors to psychology are more than twice as likely as their less accomplished colleagues to complete the degree requirements in "four years or less" (Wispé, 1965).
- In fact, given that the average PhD in psychology is received when an individual is at least 30 years old (Gupta, Gilbert, & Pierce, 1983; Lyons, 1968; Vance & MacPhail, 1964), eminent psychologists are generally taking almost half the time to get through their doctoral programs (also see Clark, 1954).
- In addition, the earlier psychologists earned their doctoral degree,
    - the earlier they tend to publish their first highly-cited contribution (Simonton, 1992b),
    - the more total publications they can eventually claim (Helmreich et al., 1980),
    - the more citations they receive from their fellow researchers (Helmreich et al., 1980), and
    - the higher the degree of their overall visibility in the field (Clark, 1954; Pressey, 1960).
- Apropos of the last point are the statistics published by Sidney Leavitt Pressey (1965), the psychologist who invented the first teaching machine. Pressey found that the first two dozen APA presidents earned their doctoral degrees at a median age of 25.7.

It has been suggested that accelerated educational advancement is indicative of a scientist with exceptional intellectual ability.

> The greater is the degree of acceleration, the more potent must be the underlying capacity. This superior intellect then manifests itself in later achievements as well.
>
> This interpretation also accounts for the variation across fields in the expected age at receiving the various academic degrees (for evidence, see McDowell, 1982; Terman, 1954).
>
> Those domains where doctorates can come at the earliest ages are also the domains that tend to feature scientists with the highest IQ scores.
>
> Hence may arise the contrast between the physical sciences, on the one hand, and the social sciences and humanities, on the other – with psychology and biology falling between.

Nevertheless, this is certainly not the only possible explanation. Quite a different account might be founded on the results regarding the curvilinear relation between eminence and the level of formal education attained.

If formal training can lead to excessive amounts of socialization and enculturation, and thus stifle the development of creative potential, as Einstein believed, then one route around this negative effect is to get through formal training as quickly as possible.

Having completed the requisite academic rites of passage at the earliest opportunity, potential talents can pursue their distinctive interests at an earlier age (Pressey, 1960).

James McKeen Cattell (1910) had something like this in mind when he worried about whether the increasingly more demanding requirements of the educational system were undermining the further progress of science.

> In plain English, the young man who must spend his early manhood in acquiring knowledge has passed the age at which he is most likely to have new ideas. The inherent difficulty we exaggerate by our educational methods. By our requirements for degrees, by our system of examinations, by our insistence on irrelevant information and ridicule of desirable ignorance and promising mistakes, we crowd on fat when the athlete should be relieved of every superfluous ounce. The doctor's thesis is supposed to be the first productive work; it is completed at the average age of twenty-eight years and is likely to be the working over of the old ideas of an old professor. In the meanwhile the creative instinct has atrophied. (p. 646).

Where the first explanation of the acceleration-achievement gave the credit to the student, this second explanation assigns the blame to the educational system. Cattell's views are obviously more in accord with Einstein's condemnation of formal training.

Institution Prestige

Yet perhaps Einstein's problems in getting his dissertation signed off may be as much his fault as that of the institution to which he applied.

> The University of Zurich was no "diploma mill" but rather it was an institution of international standing, with a reputation to maintain.
>
> This prestige extended to fields beyond physics, even encompassing psychology.
>
> More eminent psychologists have been associated with Zurich than with any other institution in Switzerland.
>
> Among the major figures with Zurich affiliations at one time or another are Carl Ludwig, Wilhelm Wundt, Eduard Hitzig, Richard Avenarius, Eugen Bleuler, Carl Jung, Karl Abraham, and Eric Lennenberg, who collectively span the period from 1849 to 1965.

In any case, this biographical datum about Einstein fits a consistent empirical finding: Eminent figures are highly likely to receive their education, and especially their higher degrees, from highly prestigious institutions.

- This linkage was first reported by Galton (1874) in his survey of FRS scientists: "One-third of those who sent replies have been educated at Oxford or Cambridge" (p. 236). This figure becomes about 50% if those who lacked university education are excluded.
- Havelock Ellis (1926) found an even higher percentage in his more heterogeneous sample of British genius, 74% of the college graduates having either Oxford or Cambridge as their alma mater.
- Significantly, it is the quality of the graduate school, not the undergraduate institution, that provides the most predictive factor (Crane, 1965).

Furthermore, it is more than just a simple matter of a larger proportion of scientists hailing from certain schools.

Those who earned their parchment from more prestigious institutions are more likely to become the most prolific and influential contributors to the field (Crane, 1965).

This same institutional advantage certainly holds for psychology as well.

> In Germany, the University of Berlin granted doctorates to DuBois-Reymond, Kurt Koffka, Wolfgang Köhler, Kurt Lewin, and Max Wertheimer (but denied one to J. R. Angell); Berlin medical degrees were bestowed upon Ernst Brücke, G. T. Fritsch, Ernst Haeckel, H. Hitzig, and Karen Horney. In Austria, the big academic power has always been the University of Vienna, from which Egon Brunswik, Christian von Ehrenfels, Else Frenkel-Brunswick, Edmund Husserl, Ernst Kris, Ernst Mach, and Otto Rank all earned PhDs, and Alfred Adler, Josef Breuer, Sandor Ferenczi, Sigmund Freud, Franz Joseph Gall, Franz Anton Mesmer all earned MDs. Finally, Harvard has produced such doctorates as Floyd Allport, Gordon Allport, Percy Bridgman, Jerome Bruner, Mary Calkins (albeit it was never received), G. S. Hall, Harry Helson, Edwin Holt, Alfred Kinsey, Stanley Milgrim, B. F. Skinner, Edward Tolman, Norbert Weiner, and Robert Yerkes, while producing MDs like Walter Cannon and William James.

Of the 161 psychologists who were deemed worthy of an obituary in the *American Psychologist* between 1979 and 1990, one third obtained their doctorates from just three schools, namely, Columbia, Harvard, and Chicago (Kinnier, Metha, Buki, & Rawa, 1994).

But let us move from idiographic details to nomothetic generalizations.
Those psychologists who obtain their advanced degrees from more prestigious institutions are more likely to

(a) start making contributions to the field earlier in their career (Rodgers & Maranto, 1989; Simonton, 1992b),
(b) produce more total output (Helmreich et al., 1980; Rodgers & Maranto, 1989), and
(c) receive more citations to their work (Gupta, Gilbert, & Pierce, 1983; Helmreich et al., 1980; Rodgers & Maranto, 1989).

It is essential to recognize that that the impact of institution prestige upon professional success is probably indirect rather than direct.

- According to the study of 485 American psychologists mentioned earlier, the quality of the graduate program directly determines the quality of the institution where one is first hired, the latter then having direct effects on both publications and citations (Rodgers & Maranto, 1989; also see Bair & Boor, 1988; Helmreich et al., 1980).
- Another study of 69 eminent American psychologists found that the only direct influence of institution quality was to lower the age at which significant contributions began to be made, the latter result then having a more immediate impact on output and influence (Simonton, 1992b; cf. Rodgers & Maranto, 1989).

Such causal chains consisting of direct and indirect effects are frequently found in other sciences besides psychology (J. Cole & S. Cole, 1973). Hence, great institutions likely only make great psychologists through a series of intermediate variables.
Although psychologists who completed their education at top-flight institutions appear to hold an edge in the quest of greatness, the advantage is by no means absolute.
Like other developmental correlates, the effect sizes are sufficiently modest so as to permit an abundance of exceptions.
To avoid offending those readers who earned their degrees at more obscure or mediocre institutions, may one incontrovertible example suffice.
I already noted that Harry Stack Sullivan was an extremely poor student. Becoming a college dropout, he was obliged to obtain his medical degree from the Chicago College of Medicine and Surgery, a school that Sullivan himself called a mere diploma mill. In fact, the institution went under not long after he got his diploma. Yet that did not prevent Sullivan from becoming a distinguished American psychiatrist.

Distinguished Teachers

E. G. Boring received his PhD under Edward Titchener, who in turn had obtained his doctorate under Wilhelm Wundt, producing a three-generation sequence of mentor-pupil relations. Hence, Boring had a highly distinguished teacher, who had himself studied under an even more distinguished teacher – the very founder of the discipline. In this section I will scrutinize this phenomenon by addressing two questions.

First, how common are such master-disciple, mentor-pupil, or teacher-student relationships?
Second, what are the specific consequences of studying under a distinguished teacher?

Teacher-student pedigrees.

Sequences like Wundt → Titchener → Boring are far from rare in the history of psychology.

- For instance, Table 10.2 displays some of the more famous of Wundt's doctoral students, followed by the students of those students, and the students of the latters' students.
- Hence, Titchener was not in any way Wundt's sole doctoral success.
- Moreover, Titchener had many more accomplished doctoral students besides just Boring, who himself can claim at least two notable doctoral students of his own, Harry Helson and S. S. Stevens.

Table 10.2

Eminent Psychologists among Wilhelm Wundt's Direct Doctoral Descendants

First Generation	Second Generation	Third Generation
H. Münsterberg (1885) →		
	Boris Sidis (1897)	
	K. Dunlap (1903) →	
		C. Murchison (1923)
	L. T. Troland (1915)	
J. M. Cattell (1886) →		
	E. L. Thorndike (1898) →	
		T. L. Kelley (1914)
	R. S. Woodworth (1899) →	
		D. Wechsler (1925)
		G. Razran (1933)
	S. I. Franz (1899)	
	C. Wissler (1901)	
	F. L. Wells (1906)	
	E. K. Strong, Jr. (1911)	
O. Külpe (1887) →		
	R. M. Ogden (1903)	
	M. Wertheimer (1904)	
	H. J. Watt (1904)	
F. Angell (1891)		
E. W. Scripture (1891) →		
	C. E. Seashore (1895)	
L. Witmer (1892)		
E. B. Titchener (1892) →		
	M. F. Washburn (1894)	
	W. B. Pillsbury (1896)	
	M. Bentley (1899)	
	G. M. Whipple (1900)	
	J. W. Baird (1902)	
	K. M. Dallenbach (1913)	
	E. G. Boring (1914) →	
		H. Helson (1924)
		S. S. Stevens (1933)
	P. T. Young (1918)	
	J. P. Guilford (1927)	
F. Kiesow (1894)		
C. H. Judd (1896)		
G. M. Stratton (1896)		
W. D. Scott (1900)		
W. Hellpach (1900)		
C. E. Spearman (1904)		
G. Kafka (1906)		
G. O. Klemm (1906)		
R. Pintner (1913)		

***Note*. Date that doctoral degree was bestowed is indicated in parentheses.**

As a prominent historian of psychology, Boring was well aware of how rather common these relationships tend to be. In fact, he co-authored an article with his daughter, Mollie, entitled "Masters and Pupils among the American Psychologists" (M. D. Boring & E. G. Boring, 1948). This paper richly documents the extent of these direct academic influences for 119 psychologists sufficiently eminent to have entries in *American Men of Science*.

So extensive are these doctoral dependencies that many contemporary psychologists are descended from Wundt, or some other notable, such as William James. For instance, Donald T. Campbell, the distinguished American social psychologist who died in 1996, was descended from both James and Wundt, the latter according three alternative pathways.

The resulting three lines of descent are as follows:

1. W. James → E. B. Holt → E. C. Tolman → R. C. Tryon → D. T. Campbell
2. W. Wundt → H. Münsterberg → E. C. Tolman → R. C. Tryon → D. T. Campbell
3. W. Wundt → J. M. Cattell → R. S. Woodworth → H. E. Jones → D. T. Campbell

These are all direct lines of doctoral descent, that is, the arrows represent direct supervision of doctoral theses (e.g., Cattell earned his PhD under Wundt's supervision).

Because Campbell himself supervised many distinguished doctoral students, this particular James-Wundt lineage continues to the present day. Among the more notable of them are Marilynn Brewer, Barry Collins, William Crano, Louise Kidder, Norman Miller, and David A. Kenny, who was my mentor in my own graduate student days.

Admittedly, some of these mentor-pupil relationships must pass through those whom some might consider "weak links."

- Neither Robert C. Tryon nor Harold E. Jones is quite in the same league as the others in the four lineages, which otherwise include many APA presidents, NAS members, and recipients of APA's Distinguished Scientific Contributions or Gold Medal awards.
- Yet both Tryon and Jones were accomplished enough as psychologists to have been included among the 119 in the Boring and Boring (1948) study, and both have had articles and obituaries written about them (e.g., Innis, 1992; Sanford, Eichhorn, & Honzik, 1944).
- Furthermore, even if Tryon and Jones were excluded, the fourth lineage remains, linking Wundt with Campbell and all of the latter's doctoral descendents.

This represents an unbroken succession of eminent teachers, each conferring a Ph.D. an illustrious student.

This lineage as well as those given in Table 10.2 are strictly defined according to the answer to the question "under whom did you get your PhD?"
Yet it could be argued that this formal definition is not the best.

- Indeed, Boring and Boring (1948) used a contrary definition whenever possible, namely who did the psychologist feel he or she did their advanced studies under, independent of the formalities.
- By this definition, the Borings did not list Lightner Witmer as Wundt's student, but rather as J. M. Cattell's.
- This was done as the result of sending questionnaires to the 72 living members of their sample and asking them "Who was it who influenced you most in psychology up to the time you got your Ph.D.?" (Boring & Boring, 1948, p. 528).
- According to Witmer, he only went to Leipzig to study under Wundt at Cattell's urging, and because he received special funds to do so. But Witmer otherwise resented Wundt, and acknowledged Cattell as his true mentor.

Wundt own career path illustrates how the mentor influences can operate along less formal paths.

- According to one historian, "Helmholtz had a marked influence on the physiologists and embryonic psychologists of the day, and it is not surprising to learn that Wundt (Helmholtz's assistant for four years at Heidelberg University) incorporated much of Helmholtz's empiricism in his own system, especially the doctrine of unconscious inference" (Capretta, 1967, pp. 78-79).
- Taking this one generation farther back, Helmholtz "never undertook formal training at a university, but was close to various leading university figures of the day, including especially the physiologist Johannes Müller at the University of Berlin" (Michael Wertheimer, 1987, p. 55).
- Thus, all of the doctoral descendents of Wundt can ultimately be considered the informal intellectual descendents of Müller, the German physiologist, with Helmholtz providing the connection to Wundt.

It is worth pointing out that the pedigrees like those shown in Table 10.2 are certainly not unique to the discipline of psychology (Simonton, 1992c).
On the contrary, E. G. Boring was first inspired to construct his intellectual genealogy of great psychologists after seeing one that had been published earlier with respect to the sciences in general (Pledge, 1939).

- An excellent illustration is those scientists who have received the Nobel prizes in physics, chemistry, and medicine or physiology (Zuckerman, 1977).
- Many laureates were students of previous laureates.
- One such sequence, for instance, is Lord Rayleigh → J. J. Thomson → Sir Ernest Rutherford → Niels Bohr → Werner Heisenberg.

As always, there are exceptions. Einstein did not study under any previous laureate, nor did he receive his PhD from an illustrious mentor, although he did have some pretty distinguished teachers when he was an undergraduate (Hermann Minkowski and Heinrich Weber).
The same can be said of the history of psychology.

- Boring and Boring provided a pretty impressive list of great psychologists whom they counted as "self-starters," much like Einstein.
- List consisted of Gordon W. Allport, J. Mark Baldwin, John Dewey, G. S. Hall, William James, H. M. Johnson, Wolfgang Köhler, George Trumball Ladd, Christine Ladd-Franklin, William McDougall, Gardner Murphey, L. L. Thurstone, and Robert M. Yerkes.
- This is a very impressive set of names.
- Even so, these are only 13 out of 119, or 11%.
- Also, some of these did receive their degrees *under* distinguished mentors, but without feeling that they had studied *with* them. This holds for Allport (under H. S. Langfeld), Hall (under James), and Köhler (under C. Stumph).
- So, 92% had some relationship with a notable teacher in graduate school, whether that relationship be nominal or genuine.

Nor is the Boring and Boring (1948) study the only one to report the high frequency of such eminent teacher-student pairs in psychology.

- In the inquiry into 69 famous American psychologists active between 1879 and 1967, about three fourths took their PhD under an illustrious psychologist (Simonton, 1992b).
- In another study of 95 eminent American psychologists who had obtained their degrees between 1910 and 1944, 73% said that they had a distinguished teacher stimulate their intellectual development in graduate school, and 83% reported that their dissertations were supervised by a notable psychologist (Wispé, 1965). The corresponding figures for a group of controls was 43% and 32%, respectively, even though the comparison group had been matched on year of doctorate and the university where the doctorate was obtained, so that they should have enjoyed the same potential opportunities as the eminent group.

Master-pupil effects.

But why?

One hypothesis may go back to what we said before about the Müller → Helmholtz → Wundt chain of informal influences.

- Müller's clearly had some highly potent ideas about developing a truly experimental physiology, so much so that he shares with von Haller the appellation of "the father of experimental physiology." Müller also had a strong inclination toward discussing physiological phenomena in psychological terms.
- These ideas strongly impressed his disciples, among them Helmholtz.
- In part through the latter's ideas, Wundt was inspired to take up the cause of a "physiological psychology," that is, an experimental psychology with deep roots in physiology.
- Powerful ideas that helped make Müller famous should help his followers become famous as well, as they trickled down through Helmholtz and Wundt.

In short, ideas that work for the master should work for the pupil.

- This explanation could explain the empirical fact that those psychologists who study under illustrious mentors are more likely to make their first important contribution at a younger age than usual (Simonton, 1992b).
- It would also help account for why the mentor's eminence is critical to the pupil's long-term success independent of the prestige of the graduate school where the doctoral degree was received (Crane, 1965).

Yet there are other realities that do not seem to sit well with this interpretation.

- First, as J. M. Cattell (1910) suggested in the earlier quotation, the mentor's ideas may already be passé, so that those who convert themselves into an intellectual clone may end up trying to establish a reputation on the basis of notions that are widely considered to be out of date.
    - This falls in line with a study of biologists that found that those who had served as a laboratory or research assistant in graduate school tended to receive fewer citations to their work once they launched their own professional careers (Segel, Busse, & Mansfield, 1980).
- A second problem is that many of the most successful scientists tend to depart radically from their mentor's ideas.
    - Many concrete instances can be discerned in Table 10.2. Not all of Wundt's students became Wundtian researchers.
        - Münsterberg quickly gave up the laboratory to become an applied psychologist. From the moment
        - J. M. Cattell arrived in Leipzig, he insisted on studying individual differences, despite Wundt's lack of sympathy for that kind of research.
        - Witmer not only refused to acknowledge Wundt as his teacher, but he became a pioneer in clinical psychology besides.
        - Although Titchener considered himself a loyal Wundtian, many of his own doctoral students strayed far from the official line.
        - Washburn became a comparative psychologist, while Guilford, like Wundt's student Spearman, became a psychometrician, with a focus on individual differences in intelligence.
        - Other great psychologists besides this particular doctoral pedigree show a similar pattern. Many of Tolman's best students, for example, cannot be said to have clearly followed in his footsteps, including Henry Gleitman, David Krech, and Julian Hochberg.
    - There is even evidence that the most successful teachers are those who give their students the largest possible intellectual freedom. Thus, the 64 illustrious scientists in Roe's

(1952) investigation asserted that they preferred most those mentors who just left them alone to do their own thing.

An alternative explanation is that the students are acquiring something far less specific, but also far more useful, namely, they are learning what one must generally do if one wants to succeed in the profession. In other words, the primary purpose of having an eminent mentor is to learn the answers to the following questions:

1. How does one go about creating and executing a life-long research program?
2. What are the standards that must be met to publish original research in the best journals?
3. How does one secure a "ladder track" position at a leading university?
4. How does one best balance research and teaching activities?
5. What are the tricks to maintaining a scientific reputation while preserving a healthy personal life?
6. What is the relative weight to be assigned to various professional and university responsibilities, such as reviewing manuscripts, attending conferences, or chairing time-consuming committees?
7. At what point in the career should one think about writing a book or monograph or textbook, who are the best publishers, and how does one secure a contract?

The pearls of wisdom provided to these enigmas would have benefits independent of whether the student turns out to be the teacher's clone or an utter iconoclast. In short, the aspiring student needs "to learn the ropes," regardless of the substantive direction the student actually takes.

- This more generalized interpretation would account for the same empirical findings as the previous one, besides handling those situations when the student does not follow up the mentor's research program.
- This account also would accommodate other findings as well. Most notably, studies of famous personalities of diverse kinds have shown that talent development seems nurtured by early exposure to eminent adults, even when the latter attained distinction in some domain other than that the youth would eventually pursue (Walberg, Rasher & Parkerson, 1980).
- Furthermore, this explanation would seem to fit better with the finding that eminent psychologists not only tend to study under eminent psychologists, but in addition they tend to supervise more doctoral students who become eminent in their own right (Wispé, 1965).

Thus, the mentor-pupil transfer of greatness can extend across multiple generations, as documented in Table 10.2.

- Yet the initial research program need not be continued for this transfer to take place. Indeed, it would seem very unlikely that the intellectual grandchildren and great-grandchildren would benefit much from pursuing such old-fashioned ideas.
- Hence, a doctoral sequence like W. Wundt → J. M. Cattell → R. S. Woodworth → D. Wechsler can take place despite the almost complete absence of any substantive continuity in their respective research programs.

This interpretation makes the seemingly reasonable assumption that the supposed "secrets of (professional) success" do not change as rapidly over time as do the intellectual fads and fashions than shape the history of psychology.

This supposition is consistent with the fact that many of the qualities that underlie the attainment are so generic as to transcend time, place, and domain of achievement (Simonton, 1994a).

Yet, for the purposes of completeness, I wish to point to the possibility of yet another, but a bit more cynical explanation. The key asset may not entail the continuation of a proven research program nor the mastery of the tricks of the trade, but rather the advantage may stem from a more basic interpersonal process – connections, connections, connections. After all, the more eminent scientists are those who sit on the editorial boards of high-impact journals, who serve on grant-review panels for the most lucrative funding agencies, who attend the most conventions and conferences, and who have many close colleagues strategically placed at major research institutions. To stay in good graces with an illustrious mentor means to have freer access to this "old-boy" network of professional opportunities. It signifies that when the time comes to enter the job quest, the mentor can provide the letter of recommendation that tip the scale in one's favor at a prestigious university. It suggests that when the beginning scientist's papers are first submitted publication at a major journal, the editor may give the benefit of any doubt because he or she is so-in-so's best student.

- This interpretation might better account for why the mentor's professional activities actually does a slightly better job predicting their proteges' later scientific output and impact than does the mentor's research emphasis (Gupta, Gilbert, & Pierce, 1983).
- It would also fit better with the finding that the positive impact of eminent mentors is maximized when their students secure a position at a prestigious research institution (Crane, 1965).
- Furthermore, having received a degree from a prestigious institution and mentor may be more critical in securing such a high-status job than is the young scientist's actual publication record (Allison & Long, 1987).

Einstein's career illustrates the potential costs to career progress should one lack such professional support. It took him a long time to work his way out of the patent office clerk into a professorship at a prestigious university. This delay occurred despite the fact that he had already published all of the papers that were to win him the 1921 Nobel for Physics. Ironically, it was the very Zurich professor who had first rejected and then approved his doctoral thesis who eventually secured for the future laureate his first academic appointment. This initial foothold occurred four years after he had earned the right to call himself Dr. Einstein.

Needless to say, it is conceivable that all three of the foregoing explanations are operative, but in varying degrees, depending on the particular mentor-pupil coupling. Moreover, it is not ruled out that some other processes are involved as well, including the genetic processes discussed in chapter 12. But right now, the task before us is to discuss two remaining features of career training – self-education and professional marginality.

SELF-EDUCATION

"I have never let my schooling interfere with my education" (quoted in Harnsberger, 1972, p. 553).

- Although it was Mark Twain who said this, the same sentiment – with much less humor and far more bitterness – might just as well come from the mouth of Albert Einstein.
- So hostile was Einstein to the interference of regular schooling that he became the equivalent of a high school dropout by withdrawing from a restrictive German gymnasium sans diploma at age 15.
- This risky decision was based on his belief that he would be able to pass the rigorous entrance examinations to the university by studying on his own.
- He had already demonstrated an impressive ability to absorb and master whatever interested him most.
- Indeed, by the time he was 16, Einstein had taught himself calculus.
- Although he was later to receive a diploma at a more liberal Swiss school, it is clear that Einstein always gave his self-education a higher priority than formal instruction.

Many key figures in the history of psychology have reported a similar proclivity.

The great physicist and physiologist Hermann von Helmholtz (1891/1971) once said,

> I must confess that many times while the class was reading Cicero or Virgil, both of whom I found very tedious, I was calculating under the desk the path of light rays in a telescope. Even at that time I discovered some optical laws, not ordinarily found in textbooks, but which I afterward found useful in constructing the ophthalmoscope. (p. 469)

When a generous uncle offered to send Herbert Spencer to Cambridge to receive a college degree, the future philosopher declined, preferring to obtain his higher education through independent reading.

Naturally, sometimes self-education is more a matter of necessity than preference. Many great names in the history of psychology had no other choice than to educate themselves.

- Clark Hull's schooling was spotty because he often had to help out on the farm.
- The physicist and chemist Michael Faraday advanced his schooling by being apprenticed to a bookbinder and bookseller, taking advantage of every spare moment to read the merchandise.

Indeed, avid reading provided the primary means by which these luminaries pursued their self-education.

Besides providing the basis for acquiring both general and specialized knowledge, being an avid reader will sometimes provide what has been called the "crystallizing experience," an encounter with a field or phenomenon that sets the individual on the distinctive trajectory to eventual achievement (Walters & Gardner, 1986).

- Hence, several notables, such as Edward Thorndike, Clark Hull, and Edward Tolman, were first inspired to become psychologists by reading *The Principles of Psychology* by William James, just as Freud's *Interpretation of Dreams* played a significant role in the lives of such figures as Alfred Adler and Carl Jung.
- When Hermann Ebbinghaus purchased a copy of Fechner's *Elements of Psychophysics*, he soon found himself set on a new career path. In a sense, such effects should not be surprising. A main reason for publishing articles and books is to exert some influence on current and subsequent generations. Moreover, it is the avid readers who have the highest likelihood of chancing upon that particular publication that will transform their lives.

In any event, there is abundant evidence that achieved eminence is associated with self-education in general, and with voracious reading in particular (McCurdy, 1960).

- For instance, a study of over three hundred 20th-century notables found a positive correlation between being an avid reader and degree of eminence attained (Simonton, 1984d).
- Likewise, Roe's (1953a) 64 illustrious scientists reported that they began to do a great deal of reading when very young.
- This pattern of early avid reading is also characteristic of the intellectually gifted, such as the high-IQ children in Terman's (1925) longitudinal study (also see Schaefer & Anastasi, 1968).

At the same time, investigations indicate some other common vehicles of self-education beyond mere reading.

- For example, one study of 335 biologists found that both publication and citation counts were positively correlated with the amount of free time spent on extra science projects or building radio sets (Segal, Busse, & Mansfeld, 1980).
- Roe (1953a) noted a strong tendency for her scientists to have developed early hobbies and interests that were closely related to their later achievements.
    - Thus, about half of her biologists showed some early interest in natural history, much like Charles Darwin did when he was a youth.
    - The social scientists, in contrast, often had early aspirations of pursing a literary career, and would frequently serve as editors of yearbooks and literary magazines.

These complexities should not obscure the principal conclusion:

Formal education probably plays a comparatively minor role in the emergence of great psychologists. Instead, it is self-education, such as avid reading or some other extracurricular involvements, that may provide the bulk of the developmental preparation.

This broadening education that goes beyond mere schooling may provide another explanation for why great scientists are so often sickly as children, as was pointed out in the preceding chapter.

Having to spend so much time alone, or interacting with parents rather than peers, such a child may more likely develop intellectual interests beyond the purely scholastic.

- Helmholtz illustrated this possibility: "During my first seven years I was a delicate boy, confined for long periods to my room and often to bed; nevertheless, I had a strong inclination toward several occupations and activities. My parents busied themselves a good deal with me, while picture books and games, especially games with wooden blocks, filled the rest of my time. In addition, reading came fairly early, and this, of course, greatly increased the range of my occupations" (Helmholtz, 1891/1971, p. 468).
- Another example was the great French philosopher René Descartes. While a student at a Jesuit school, he proved too sickly to follow the routine of his fellow students, and so he was allowed to stay in bed. He took advantage of this opportunity by indulging a voracious appetite for reading.

Although ill health in youth can encourage the disposition toward independent learning, the causal arrow can sometimes go in the reverse direction, albeit it may be less common. In order to justify withdrawing from the gymnasium, Einstein obtained from the family doctor a medical certificate affirming that he needed time for recuperation – even though there was absolutely nothing wrong with his health. Dropping out just gave Einstein the leisure to do what he wanted to do: engage in his self-education without the school's interference.

PROFESSIONAL MARGINALITY

In chapter 2 I first introduced Kuhn's (1970) internalist theory of scientific revolution, which centers on the process by which revolutionary scientists replace the old paradigm that guides normal science with a new paradigm.

> From a psychological perspective, one of the more interesting features of his theory is Kuhn's (1970) speculation about the characteristics of those who become a scientific revolutionaries. "Almost always the men who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change" (p. 90). This is the case, Kuhn explained, because
>
> > obviously these are the men who, being little committed by prior practice to the traditional rules of normal science, are particularly likely to see that these rules no longer define a playable game and to conceive another set that can replace them. (p. 90)
>
> Albert Einstein certainly serves as a prime example. At age 26, and a professional outsider, he nonetheless published two papers that revolutionized physics, one on the photoelectric effect and the other on special relativity.
>
> Newton provides another obvious instance. At about the same age, and in relative isolation from the scientific circles of his day, Newton came up with mathematical and physical ideas that were to revolutionize the exact sciences.

Historians of psychology have sometimes suggested that the same principle has operated in psychology's own past as well.

- Typical is this statement: "Like many innovative scientific thinkers, Skinner received little early training in his discipline" (Leahey, 1992, p. 389). Skinner was an English major in college.
- In a like fashion, Carl Rogers originally pursued religious studies, L. L. Thurstone studied electrical engineering, Edward Tolman electrochemistry, Henry Murray history, and Roger Sperry English literature. Rogers had only taken one course in psychology as an undergraduate – and that by correspondence – while Murray attended just one lecture in psychology, finding it so boring that he walked out.
- Even at the doctoral level, there exist many conspicuous departures from the expectation that a great psychologist must receive a PhD in psychology. Exceptions include Christine Ladd-Franklin (mathematics), George Békésy and Percy Bridgman (both physics), Henry Murray (biochemistry), Karl Lashley (genetics), Jean Piaget, Alfred Kinsey, and Sperry (all zoology), Herbert Simon (political science), Otto Rank (German philology), Noam Chomsky (linguistics), Leta Hollingworth (education), Erich Fromm (sociology), and Edwin Guthrie (philosophy).
- Furthermore, many great psychologists obtained medical rather than doctoral degrees. Pioneers like Wilhelm Wundt, William James, Sigmund Freud, and Ivan Pavlov are among the more salient examples.
- Perhaps it is significant that every Nobel laureate who has some place in the annals of psychology – namely Pavlov, Békésy, Bridgman, Simon, and Sperry – had no advanced degree in psychology.

Sometimes the positive effects of such professional marginality seemed to occur simply because the newcomer could offer a fresh outlook, as Kuhn (1970) had suggested.

But other times the more critical factor appears to be that the outsider could import into the discipline concepts, perspectives, or techniques that have proven useful in some other field.

- "It has often happened that critical stages for advance are reached when what has been called one body of knowledge can be brought into close and effective relationship with what has been treated as a different, and a largely or wholly independent, scientific discipline," observed F. C. Bartlett (1958, p. 98), whose own degree (an MA) was in "moral sciences."
- Helmholtz (1891/1971) described such a cross-fertilization process in his own case: "I must, however, say that I attribute my success in great measure to the fact that, possessing some geometric understanding and equipped with a knowledge of physics, I had the good fortune to be thrown into medicine, where I found in physiology a virgin territory of great fertility. Furthermore, I was led by my knowledge of vital processes to questions and points of view which are usually foreign to pure mathematicians and physicists" (pp. 472-473).
- At times the outside perspective may not even entail another science, but rather the humanities or even the arts. "It has long been noted that William James, one of the founders of philosophical pragmatism as well as psychological science, had the sensibility of an artist. It has also been suggested that his artistic sensibility made a tangible difference in the crafting of his thought, both in philosophy and in psychology" (Leahey, 1992, p. 152). At age 18 James actually aspired to become an artist, studying painting six months in the art studio of William Morris Hunt, but there discovered that his passion for drawing could not be mistaken for genuine talent.

Being a professional outsider may have its drawbacks. James' penchant for the aesthetic made Wundt conclude that his *Principles of Psychology* was more a literary than a scientific achievement.

More generally, it may take longer for professionally marginal figures to have their work appreciated by the mainstream members of the discipline.

- Thus, the following has been said of Freud: "The fact that both the system and its originator were outsiders also complicated and delayed their acceptance" (Schultz & Schultz, 1992, p. 450).
- In a similar vein, "Kierkegaard was slow to influence the intellectual life of the west, partly because he wrote in Danish, and partly because he was in many ways an oddity, who stood outside the main movements of the time" (Hearnshaw, 1987, p. 233).
- Another illustration is Jean Piaget, whose "genetic epistemology" took a long time to get a firm foothold in developmental psychology, especially in the United States.

Yet the foregoing comments are nothing but anecdotes and conjectures (cf. Hudson & Jacot, 1986). There is actually very little solid evidence that the revolutionary scientists are more likely to have received training marginal to the discipline in which they eventually had their notable impact.

One inquiry examined X-ray astronomy to determine if the whether the major innovators in the field were in some sense outsiders (Gieryn & Hirsh, 1983).

- Professional marginality was gauged by such factors as youth, recent entrance into the discipline, affiliation with marginal institutes or with industrial laboratories rather than research universities.
- Although the investigators concluded that marginality played no role, a reanalysis of their statistics revealed that a composite index consisting of these factors accounted for more than 20% of the variance (Simonton, 1984e).

Whether similar predictive power might be found for those responsible for major paradigm shifts in psychology remains to be determined.

The few published investigations that have any relevance fail to provide a clear picture.

The study of 69 deceased eminent psychologists found that those who lacked a PhD in psychology did not have any advantage in terms of eminence, publications, or citation impact (Simonton, 1992b).

Another study of 95 still-living eminent psychologists showed that they were more likely to be affiliated with major research universities (Wispé, 1965).

These findings are only obliquely related to the question at hand, because eminent scientists do not have to be revolutionary scientists. Kuhnian normal scientists who make significant contributions to an established paradigm can also attain high degrees of distinction in the sciences.