

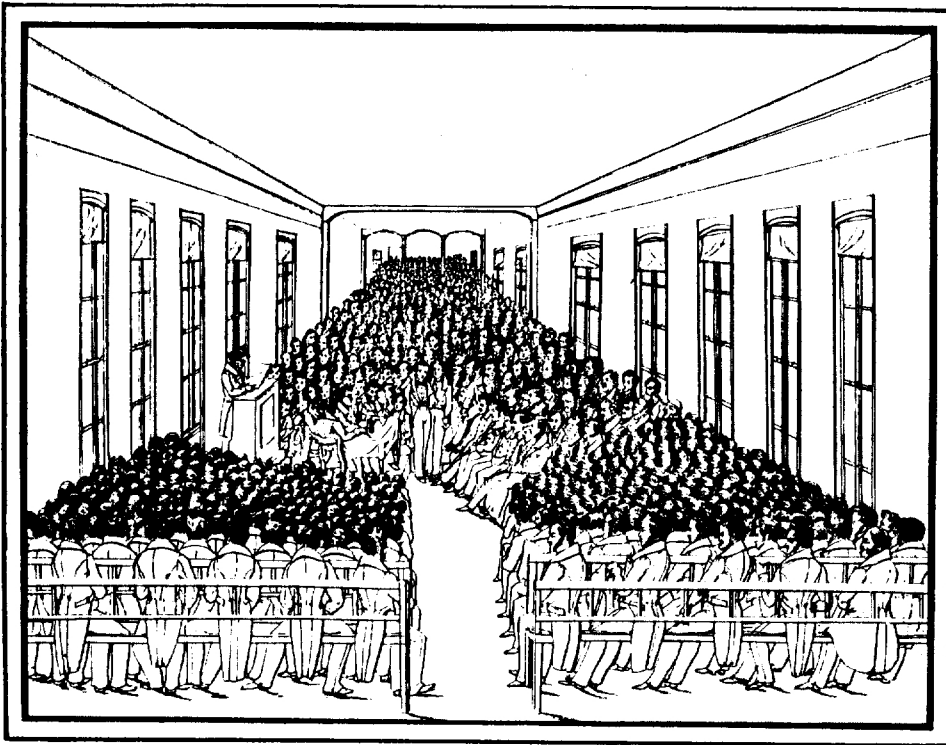
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ISIS

AN
INTERNATIONAL
REVIEW
DEVOTED TO
THE HISTORY
OF SCIENCE
AND ITS
CULTURAL
INFLUENCES



*On the life sciences in Germany
See pages 337, 365, and 390.*

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mainly discussed passes to Julius Axelrod to Solomon Snyder to Candace Pert—who, with many collaterals, have revolutionized our understanding of the chemical basis of the nervous system and of the drugs that influence it. The scientific fascination and practical importance of the field notwithstanding (e.g., Tylenol, and our best shots at understanding schizophrenia), the work of this dynasty does not resemble a Kuhnian revolution of conceptual paradigm. The individual steps of progress are remarkably straightforward. They comprise mainly the application of analytical chemical methods to the distribution and metabolism of substances that influence the nervous system. The aggressive mood of appeal to experiment at every opportunity—don't be afraid to be wrong some of the time, and by no means wait for theoretical clarity—is probably the central operational and psychological theme.

The warp that binds the web of personality, institutional setting, research strategy, and scientific circumstance is the mentor relationship, from generation to generation. That relationship resembles family life as exemplar of affection and cooperation; like the family, it may also harbor ambivalence, intergenerational conflict, even exploitation and the bitterness of divorce. The competitive striving for individual recognition is central to the incentive systems and the work opportunities of science. This is the main stressor in the interpersonal relationships of scientists, and the more for saplings in the shade of their academic progenitor.

So here, Kanigel recites in rich detail how all the generations of "apprentices to genius" acknowledge their profound mutual debts, and how each has striven for particular individual recognition.

Why are scientific dynasties so successful? (Keep in mind that we have not sampled the failures. We particularly ignore the distressing pathologies of fraud that are most likely to arise where a mentor's supervision of too-large research groups was inevitably superficial.) With appropriate leadership the young scientist may have the ideal incubator furnishing friendly but unrelenting criticism, guidance in the development of taste in the selection of research projects and in overarching strategies and problem-solving methods. How much the student has to learn of discipline, integrity, optimism, and perseverance! Ideally this is followed by strong encouragement toward

ever-increasing independence. Such incubators also offer untrammelled facilities, access to informal scientific communication, know-how in seeking funds. When good taste and success in the selection of young apprentices have been demonstrated, they lead to a virtuous cycle of attracting the best-qualified candidates and in augmenting the mentor's experience and skill in selecting from them. Finally, the apprentice will be educated and socialized in a like responsibility toward the next generation. This is sometimes mocked as a "Matthew effect," but it has been an extraordinarily effective system of finding and nurturing the best scientific talent.

This picture does not clarify how the dynasty starts. Bernard Brodie came out of nowhere. He and many of his line were atypically late starters; Brodie was a high school dropout, a gambler, and a boxer before discovering his scientific bent. Julius Axelrod won his Ph.D. at age forty-three. Sol Snyder's original career plan was the practice of psychiatry: his boyhood talents were in music. Candace Pert hopped from school to school: her first ambitions were in English literature.

For a work that borrows many arcane terms from the professional journals, there are rather few errors and misspellings. Some should be remarked to forfend a propagation of errors. Gobind Khorana is (like myself) a great admirer and sometime collaborator, but not a scion, of Arthur Kornberg. The oft-mentioned Roland Ciaranello is in fact Ciaranello. L. G. Whitby came to Axelrod from Cambridge University, not the Rockefeller University.

Systematic scrutiny of the mentor-apprentice relationship in science was initiated by Harriet Zuckerman in her *Scientific Elite* (1977). Kanigel's flavorsome contribution may now stimulate some *Isis* readers to add to the small body of equally informed and scholarly history of contemporary science. It will be quite an assignment to do that and achieve so readable a book as well.

JOSHUA LEDERBERG

Robert Kanigel. *Apprentice to Genius: The Making of a Scientific Dynasty.* xiv + 271 pp., index. New York: Macmillan, 1986. \$19.95.

Apprentice to Genius is a Joseph's coat of variegated threads, a beguiling combination of sociological and scientific scholarship, straight reporting and titillating voyeurism. This helps communicate far more of the substance of the science it chronicles—neuropharmacology—than most of its readers would voluntarily ingest. One must still be on guard against taking the book as the last word on many judicious items of testimony, for example, about competing claims for priority. The author shows every sign of earnest effort at balance and fairness; but without personal depositions, we cannot be certain how faithfully each protagonist is represented.

The scientific dynasty of this book starts with Bernard Brodie. However, James Shannon is masterfully portrayed as the *éminence grise* of the enterprise. As a research director at New York's Goldwater Hospital, and later as director of the National Institutes of Health, Shannon had the insight and organizational acumen that launched Brodie and many of his followers and shaped the institutions that enabled their work. The dynastic mantle is not strictly primogenitive; but the lineage