"Spandrels" Dissected

Understanding Scientific Prose. JACK SELZER, Ed. University of Wisconsin Press, Madison, 1993. xvi, 388 pp., illus. $60 or £54; paper, $19.95 or £18. Rhetoric and the Human Sciences.

While S. J. Gould and R. C. Lewontin's (1979) paper "The spandrels of San Marco and the Panglossian paradigm" has forever changed the old, unquestioningly "adaptationist" attitudes of most biologists, it is an unconventional piece of writing. As scientific prose, its dramatic energy and imagery render it a model to some readers and a case of puffery to others. But there is no doubting the paper's influence on the field of evolutionary biology: seminal, as they inevitably say. The paper is scarcely representative of scientific prose in general or of the *Proceedings of the Royal Society of London* (where it appeared in a collection on adaptation) in particular. Principally Gould's creation, it is, as he says in this volume of essays devoted to it, a distinctly personal "opinion piece" and as such falls outside the rules (whatever they are, and they are probably unnecessarily restrictive) of the "paper." Intended as a challenge to orthodoxy, it was deliberately crafted as a *tour de force*, leaving the interesting question whether its central message would have been so compelling if its exposition had been less polemical.

Here 16 experts in rhetoric, literary theory, and writing combine for a thorough scrutiny of Gould and Lewontin's paper in terms as diverse as those of intertextual fashioning, feminism, and deconstruction. At first sight one might not know whether to laugh or cry at the notion of this supercolliding of analytical theories. But this unique book is a great success, especially for the diversity of readings the authors give to the work under scrutiny. Parts will make anyone except a literary critic groan. Parts will make the average scientist squirm: scientific writing is supposed to be objective, nonpolemical and passion-free, isn't it? Should there—could there—be such a thing as a Marxist, feminist, you-name-it–ist scientific paper? (The answer is in the old joke about the southern Baptist who was asked if he believed in infant baptism. His answer: "Hell, yes, I've seen it done.")

One sees an interesting cross section of the readings of the different authors in their treatment of A. Seilacher, whose "constructional morphology," first expounded in 1970, arguably forms the principal conceptual basis of the paper. Gould and Lewontin used the eponymous spandrels as a specific "nonbiological" example of this concept. D. Winsor (p. 134) finds that Gould and Lewontin extend Seilacher's evidence, transforming it into "evidence to prove their point (which they say is also Seilacher's own)." S. Wells finds them "lyric in the evocation of" Seilacher (p. 56), and G. Gragson and J. Selzer (p. 194) find Gould and Lewontin "salut[ing] among the living those few who are yet in the state of grace (e.g., Lande, Riedl, Seilacher, and themselves)." J. Fahnestock raises a charge of "mysticism" against Seilacher (p. 176). M. Rosner and G. Rhoades note Gould and Lewontin's statements that Seilacher was "generally sound" and "probably right" but complain that in setting up only this "single perspective" representing him as a hero they have failed to examine their own biases (p. 95). Gould in his closing commentary sees the spandrels metaphor as "the only truly original point in the paper" (p. 325).

After 14 chapters of analysis, Gould's final commentary is a disappointment. Written partly in a disingenuous, "I'm just a country boy from Harvard" style and loaded with classical tags and the obligatory references to baseball, it is almost a parody. But having been credited with (and mostly disavowing) all this refined literary accomplishment, he was placed in a tricky position.

Writing is where science (the organization of knowledge and explanation of causality) and art (the search for and expression of meaning) come together. It is something that no scientist can afford to neglect, because everything we write has layers of both structure and meaning, intended or unintended. However, whether expounding the old New Criticism or deconstruction theory, literary critics and rhetoricians tend to be ignored by scientists, who, if they pay any attention to their own writing at all, have been brainwashed into adopting a mode of impersonal declarative prose quite at odds with "fine" writing and subtlety of meaning. By analyzing a piece by one of us, these essays open up the otherwise forbidding world of textual analysis to the scientist-writer. It is a wonderful glimpse into that world (or worlds) and a challenge to ours.

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Biomedical Progenitor

Archibald Garrod and the Individuality of Man. ALEXANDER G. BEARN. Oxford University Press, New York, 1993. xviii, 227 pp., illus. $49.95 or £35.

In this work of loving scholarship, Alexander Bearn has provided geneticists as well as a wider audience with the first full biography of Sir Archibald Edward Garrod, for the past 35 years recognized as the somewhat neglected father figure of biochemical genetics and the concept of human biochemical individuality. The key dates in this chronology are commonly set at 1908, the year Garrod delivered in London the Croonian Lectures published as *Inborn Errors of Metabolism*, and at 1958, 22 years after his death, the year when G. W. Beadle in his Nobel Prize lecture graciously recognized Garrod's seminal work. It would be easy to cast Garrod as a latter-day Mendel by virtue of his neglect by his contemporaries, and this is sometimes done. In fact, there is little similarity. Mendel was an obscure monk in an obscure town who published in an obscure journal a concept that the few who read it at the time failed to grasp. Garrod, as Bearn documents well, was for three decades a prominent figure in English medicine, ultimately, in 1920, succeeding Sir William Osler to the most prestigious position in English medicine, the Regius Professorship at Oxford. Garrod's message was widely heard and even to some extent understood, but it was not considered especially relevant to the medicine of the day. Whereas Mendel's message transformed a science, it was necessary for medicine and genetics itself to undergo substantial transformations before the full impact of Garrod's message became apparent.

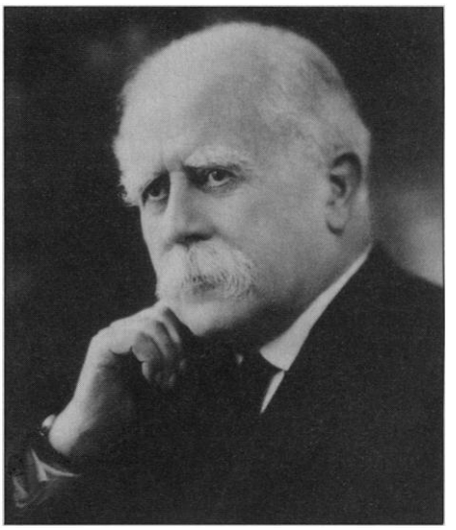
Garrod was born in London in 1857. His father was a prominent physician, and the young Garrod developed in a rich intellectual environment. From his early years he displayed a strong interest in the sciences (as distinguished from the classics). There never seems to have been doubt that he would pursue a career in medicine. Graduating in 1885 from the course offered by the Royal Hospital of St. Bartholomew, he methodically took all the steps necessary to a place of prominence on the London medical scene. His medical scholarship was broad, his early publications ranging from "An introduction to the use of the laryngoscope" to "A treatise on rheumatism and rheumatoid arthritis." However, in due course he became much more interested in the chemical side of medicine, in those days mainly approached through studies of the

urine. With Frederick Gowland Hopkins, and using spectroscopy extensively, he published numerous papers on abnormal urinary pigments in the 1890s, himself undertaking the laborious chemical isolations necessary to identify specific compounds. Moving on to his "inborn errors of metabolism," he published his first paper on alkaptonuria in 1899. His classic 1908 Croonian Lectures dealt with alkaptonuria, albinism, cystinuria, and pentosuria. The uniting theme was that each of these could be interpreted as the result of a block at some point in the normal course of intermediary metabolism. Garrod clearly recognized the implications of the increased frequency of consanguinity in the parents of affected children for a genetic etiology, but it was apparently William Bateson who suggested to him that this was indicative of Mendelian recessive inheritance. This dedication to the study of inborn errors came to culmination in *The Inborn Factors in Disease*, published in 1931, where his concept of human biochemical individuality found its fullest expression. Disease in an individual, to Garrod, had always to be studied in the light of that individual's complex, genetically determined biochemical individuality. A simple sentence from that work succinctly summarizes his thesis: "It must never be forgotten that it is not only in causing predisposition that internal factors are concerned, but also, that upon the patient's constitution depends the form which the morbid syndrome assumes."

Garrod wrote well and was in demand as an editor. Something of a polyglot, in the late 1890s he translated several treatises on disease written in German or French into English. Between 1900 and 1930, there would appear from Bearn's account to be few important medical lectureships in London he did not hold or recognitions he did not receive. He could scarcely have had better podia for his views. He was not a dashing clinician in the tradition of Osler, but, with his preoccupation with the chemistry of disease, was seen as the foremost proponent of "scientific medicine" of his times. He had a special interest in diseases of children and was the primary instigator of an outpatient department for children at his alma mater, St. Bartholomew's Hospital, and coauthored a very successful textbook of pediatrics. From 1914 to 1918, he served the British Army with distinction on Malta, a major clearinghouse for British military casualties. The war brought him great personal tragedy—he lost all three of his promising sons. In 1920, he succeeded the great Osler as Regius Professor of Medicine at Oxford. Always a good administrator, he substantially advanced the cause of medicine at Oxford. He died in 1936.

In retrospect, the reasons for the failure of the scientific community to recognize the full implication of Garrod's work were not the same in the first two decades of this century as in the second two. In 1899, the year Garrod published the first of his substantive papers on an inborn error of metabolism, influenza and pneumonia, tuberculosis, gastroenteritis, diphtheria, and typhoid fever were among the ten principal causes of death. Despite the spectacular manner in which alkaptonuria announces itself—the oxidation of the large amounts of homogentisic acid excreted in the urine turns diapers black—it is small wonder that a paper on a non-fatal disease with a frequency of 1 in 100,000 to 300,000 births did not attract great attention. The situation was not much different nine years later, with respect to the Croonian Lectures, since albinism, cystinuria, and pentosuria were only slightly more common, and no more life-threatening, than alkaptonuria, and so of almost negligible interest to the practicing physician. Garrod's work was known to and quoted by two very prominent early Mendelists, Bateson and R. C. Punnett, as an example of recessive inheritance in humans. Lancelot Hogben, an early human geneticist of distinction, gave fulsome credit to the genetic implications of Garrod's work on alkaptonuria in a paper published in 1932. But medicine—and for that matter, genetics—were simply not ready for the full implications of Garrod's writings. On the other hand, as Mendelian genetics blossomed in the 1920s and 1930s, Garrod himself, then in his 60s, never truly recast his thesis of inborn errors and chemical individuality into Mendelian terminology, and since, given the deterioration of much of the study of human genetics into uncritical eugenics, the experimental geneticists of the day were scarcely looking to the literature on human genetics for enlightenment, Garrod's work did not come to their attention. Garrod's message was widely heard and to some extent appreciated by some of his peers, but it was not until genetics and medicine "went so biochemical" following World War II that it could be fully appreciated.

"In 1899 the French town of Aix-les-Bains named this street for Sir Alfred Garrod [the father of Archibald]. In their dedication, the municipal council honored his writings on gout, which stressed the value of the waters at Aix, and brought at least 1200 new patients to take the treatment there." [From *Archibald Garrod and the Individuality of Man*]



Archibald Garrod, 1927. [From *Archibald Garrod and the Individuality of Man*]

There have been two previous major attempts to provide the scientific community with a broader appreciation of Garrod, Harry Harris's *Garrod's Inborn Errors of Metabolism* (Oxford University Press, 1963) and C. R. Scriver and B. Childs's *Garrod's The Inborn Factors in Disease* (Oxford University Press, 1989). Both these were much more concerned with updating Garrod's science than with personalities. Now Bearn, while by no means neglecting the science, has closed the circle with this fascinating picture of the man. It is not hyperbole to suggest that among human geneticists Bearn's qualifications to undertake this study are almost unique. Himself the product of the system of English (London) medical education, he has devoted much of his career to the study of inborn errors of metabolism. On top of this, he has clearly found the time to dig deeply into Garrod's life and times. I am finding that too often contemporary historians of science approach their subject with a revisionist bias that takes precedence over what of the scientific facts they just barely understand. Here is a book of profound scholarship, superbly written, that can take its place with the best.

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