A Nobel Retrospective

Science, Technology and Society in the Time of Alfred Nobel. Papers from a symposium, Björkborn, Karlskoga, Sweden, Aug. 1981. CARL GUSTAF BERNHARD, ELISABETH CRAWFORD, PER SÖRBOM, and ELISABETH HESELTINE, Eds. Published for the Nobel Foundation by Pergamon, New York, 1982. xvi, 426 pp. $59.50.

This valuable collection of essays results from the convening of North American, British, and European scholars at a Nobel Symposium held in 1981. The symposium marked the 80th anniversary of the first awarding of the Nobel prizes in 1901, and the participants' papers and discussions center in large part upon developments in the sciences, medicine, and technology at the turn of the century. An important focus of several of the papers is the early history (1901–1930) of the Nobel prizes in physics, chemistry, and physiology or medicine, and it is in this respect that the volume is most novel.

In 1974 the Nobel Foundation allowed access for purposes of historical research to materials that determined prize decisions dating back 50 years or more. Some of the scholars at the 1981 symposium have studied these materials, and the results are fascinating and significant for a better understanding of both the history of the prizes and the evolution of scientific research and scientific disciplines in the modern period. In addition, valuable new insights result with respect to the history of Swedish science, through studies of the deliberations of Swedish scientists who served on Nobel prize committees and who voted on Nobel awards as members of the Swedish Royal Academy of Sciences and the Karolinska Institute.

In an introduction to the essays dealing specificially with archival studies of the Nobel prizes, Elisabeth Crawford gives an informative and useful discussion of the procedures for nomination and evaluation of prize candidates. Crawford and Robert Friedman analyze in a jointly authored essay, as do G. Küppers, N. Ulitzka, and Peter Weingart in another, the various judgments exercised by the committees, and by the Academy or Institute, in deciding what is significant in scientific progress. For example, the Nobel bequest requires the prizes in the sciences and medicine to be given to individuals who during the preceding year have conferred the greatest benefit on mankind through the "most important discovery" or invention or improvement. Though nominations of candidates might be made for overall achievements or influence in a field, the committees must cite a specific discovery or achievement as justification for an award.

In addition, particularly in innovative work, the question may arise of the relevant disciplinary affiliation for the work. Questions may emerge about splitting a prize among several candidates or the order in which successive prizes are to be awarded. In the case of new work in radioactivity, for example, both the physics and the chemistry committees were interested in making awards. The first prize in the field was in physics (Henri Becquerel and the Curies in 1903), but Ernest Rutherford soon received an award in chemistry (1908). Regarding the order of awards, several contributors discuss the cases of Max Planck and Albert Einstein. It would have been difficult, for example, to award Niels Bohr or Einstein a prize citing contributions to quantum theory until Planck received a prize (as he did for 1918).

Regarding the role of nominations in the evaluation process, the question arises of how closely the Nobel committees followed consensus in the nominations. And to what extent did national rivalries or national scientific traditions influence the nominating procedure? Küppers, Ulitzka, and Weingart are interested in these questions, suggesting that in the first decade of Nobel awards there was a higher level of consensus among nominations than later and that the Academy appears in the early years to have relied more heavily than later on the "vote" of invited scientific nominators. On the other hand, Bengt Nagel's essay on Planck shows that, given a good reason, the physics committee could resist high nomination pressure for a considerable time. It turns out, too, that the number of German nominators was relatively high compared to that for other countries and that, in general, nominators favored candidates from their own nation. However, no clearly warranted generalizations emerge about national distributions of prizewinners. What is clear is that the Nobel awards quickly acquired and retained a high degree of legitimacy and respect within the scientific community as a whole. The symposium demonstrates impressively that the success of the prizes is in large part due to the fact that forces working within the Swedish scientific community were similar to those working within the larger scientific community.

For example, Crawford and Friedman note the strong experimentalist bias of Swedish science in the early years of the Nobel prizes. Members of the Nobel physics committee preferred to reward precision measurements, like those of Albert Michelson (1907) or Charles Guillaume (1920), and committee members were suspicious of theoretical and mathematical physics, as exemplified in the work of Henri Poincaré or Einstein. Nagel's essay on Planck notes that once scientists began to realize about 1908 the theoretically revolutionary implications of Planck's quantum hypothesis, enthusiasm actually declined for awarding him a prize. Claire Salomon-Bayet notes, too, that a large proportion of early prizes in physiology or medicine went to microbiological work, which was more "certain" in its results than neurophysiology, genetics, or Freudian psychiatry. This experimentalist bias surely is a reflection of what John Heilbron terms the "descriptionist" or phenomenalist epistemology characteristic of *fin-de-siècle* science. And when, as Armin Hermann notes, theoretical physicists became senior enough to hold physics chairs after the First World War, the Nobel prize committees also changed in orientation, with an increased interest in theoretical and especially atomic physics, again reflecting trends in the larger scientific community.

Another reflection of the state of science at the time is the designation by Alfred Nobel of a prize in physiology *or* medicine, suggesting, as Salomon-Bayet comments, that physiology was not a neutral term at the time of Nobel's bequest in 1895. Several symposium authors deal with developments in biochemistry, physiology, immunology, and tropical medicine, and they make clear that tension emerged, and still exists, between the newer experimental laboratory medicine and the older descriptive clinical medicine, dating back to Hippocrates. Several participants set up a dichotomy between the "science" of medicine and the "art" of medicine.

In a discussion paper, Charles Lichtenthaeler uses the phrase "engineerdoctor" to characterize the training of medical scientists, reinforcing another theme: that transformations were already under way around 1900 in the direction of "Big Science." Brigitte Schroeder-Gudehus notes that the word *Grosswissenschaft* was already coined in 1890 and that demands for the organization and reorganization of scientific research, at both local and international levels, were often based upon industrial models. Several authors provide both general and detailed discussions of technological and industrial growth in the period 1860–1930, as well as insights into the relations among industry, science, and engineering. As Heilbron notes, academic science was becoming expensive by 1900, and many laboratories were taking on the appearance of factories. A rhetoric common to international rivalries used the language of scientific and industrial warfare, as governments devoted increasing financial support to scientific and engineering education.

Heilbron suggests that the institution of the Nobel prize probably helped the prestige of science at a time when its industrial usefulness, rather than its intellectual content, was vigorously emphasized. Many of the symposium authors show that the Nobel prize awards directly influenced science in other ways as well. The Nobel prize legitimated certain fields of scientific research and probably hastened their development. Salomon-Bayet points out, for example, that the Nobel committee for medicine moved more swiftly than the universities in recognizing the place and significance in medicine of the new disciplines of microbiology and bacteriology. Similarly, Erwin Hiebert notes that as late as 1905 many chemists, especially at Berlin, were indifferent or hostile to the physicalist, ionist approaches of J. H. Van't Hoff and Svante Arrhenius. The award to them of prizes in chemistry (1901, 1903) legitimated their physical approaches to chemistry. Further, as Crawford and Friedman show, Arrhenius's influence on prize decisions favored atomist views in physics and chemistry, as did C. W. Oseen's influence in the 1920's.

In conclusion, for the general period 1860–1930 this symposium demonstrates in a remarkably coherent way important developments in the history and character of the modern sciences, as well as of the Nobel prize awards. It is a volume of interest to a wide audience concerned with science, medicine, and technology.

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Linnaeus Viewed from Sweden

Linnaeus. The Man and His Work. TORE FRÄNGSMYR, Ed. Translated from the Swedish. University of California Press, Berkeley, 1983. xii, 204 pp. + plates. $25.

One of the undertakings of historians of science in the last two decades has been the debunking of myths regarding the lives of scientists and the practice of science. As a consequence, the educated public no longer perceives figures like Newton, Darwin, or Harvey as demigods, nor is science viewed as a straightforward, cumulative acquisition of knowledge about the world.

Linnaeus, the famous arbiter in systematics, is one of the heroic figures in the history of the biological sciences who is being scrutinized and re-evaluated by historians of science. *Linnaeus: The Man and His Work* contributes to that reappraisal. It consists of translations of four essays by Swedish historians, and it is of particular interest because it stresses the Swedish perception of Linnaeus. Sten Lindroth's essay "The two faces of Linnaeus" describes the romantic cult that developed in Sweden around Linnaeus's memory and that influenced later historians both in and beyond Sweden. The essay discloses how the myth came into being, and it proposes a more balanced and realistic image of Linnaeus. Tore Frängsmyr's essay "Linnaeus as a geologist" discusses some of Linnaeus's geological ideas within the context of the geological controversies of 18th-century Sweden and thereby makes sense of some of Linnaeus's lesser known and more curious writings.

The Swedish perspective of these essays contributes in some ways to a broader judgment on Linnaeus; however, it also imposes limits on the inquiry, for the essays ignore much of the historical work done on Linnaeus and his context by historians outside Sweden. Gunnar Eriksson's essay "Linnaeus the botanist" presents a detailed analysis of the origin of Linnaeus's sexual system of classification and of the central problems with Linnaeus's systematics and an appreciation of what we would today call Linnaeus's ecological writings. Yet the essay would be considerably enhanced if it took into account the excellent studies on the same subjects that have been published outside Sweden in the last two decades. Similarly, Gunnar Broberg's essay "*Homo sapiens*: Linnaeus's classification of man" would have benefited from a consideration of the recent non-Swedish writings on the history of anthropology and on 18th-century concepts of man. Moreover, all four authors employ a "history of ideas" approach that will strike many American historians of science as old-fashioned, for much of the writing done in the United States on subjects such as the history of classification or the concept of man in the 18th century has taken into account the broader social and cultural contexts in which those ideas were set.

The four essays in this volume appeared originally in Swedish between 1965 and 1978, and three of them are chapters of larger works. As a result, the anthology has a choppy quality that could have been avoided had the essays been reworked for this book. Nonetheless, in spite of occasional lapses into Whiggish history and the limits of their perspective, these four essays contain intelligent discussions and raise important issues. They can be read with profit by the non-specialist and should have a wide audience.

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Southern Mammals

Mammalian Biology in South America. Papers from a symposium, Linesville, Pa., May 1981. MICHAEL A. MARES and HUGH H. GENOWAYS, Eds. University of Pittsburgh Pymatuning Laboratory of Ecology, Linesville, Pa., 1982. xii, 540 pp., illus. $30. Pymatuning Symposia in Ecology, vol. 6.

The mammalian fauna of South America is probably less well known than that of any other continent. It is a rich, diverse, and historically fascinating fauna. Thus it is of increasing interest to mammalian taxonomists, ecologists, biogeographers, and others. In May 1981, the editors of this volume convened a conference to review the status of our knowledge, to discuss current research, and to consider our concerns and priorities for the future. *Mammalian Biology in South America* presents the proceedings of that conference in 25 chapters and two summaries of round-table discussions. Few South American mammalogists attended the conference or contributed to the book, in spite of the editors' attempts to obtain travel funding and to solicit manuscripts from those who could not attend.

Approximately half of the chapters are literature reviews, including contributions by Pine on systematics, Webb and Marshall on historical biogeography, McNab on physiology, and Lacher on