

to anyone interested in early Victorian England. It will be invaluable to Darwin scholars. More generally, anyone interested in understanding the development and growth of an outstanding human being will find rich rewards in it. The appearance of this first volume of the *Correspondence* is a major publishing event. We look forward eagerly to the publication of the subsequent volumes.

A glimpse of what is to be expected in those volumes can be obtained from another impressive work by the editors. Appearing simultaneously with volume 1 is a 690-page *Calendar of the Correspondence of Charles Darwin, 1821–1882*, which summarizes 13,925 items including autograph letters by Charles Darwin (CD), copies of letters by him made by Francis Darwin for *The Life and Letters of Charles Darwin* and *More Letters of Charles Darwin*, letters by CD published in magazines such as the *Gardener's Chronicle* and *Nature*, drafts of letters, third-party letters in which Darwin is a central concern, memoranda, letters listed in sales catalogues of auction houses, and, finally, empty covers and envelopes. Each entry gives the name of the correspondent, the address, the date, and a summary of the content. If the letter has been published, a bibliographical reference has been added; also recorded is the location of the original or copy. Three very useful appendixes contain, respectively, bibliographical information on Darwin's books, pamphlets, transcripts of manuscripts, and collections of letters and papers; a bibliography of works containing printed Darwin correspondence; and a bibliographical register and index of all the correspondents. A 43-page index (in small print with three columns to a page!) allows the reader easily to find materials that appear in the calendar summaries.

The entries are usually no more than three or four lines long yet are full of information. At times, for particularly important letters, a phrase or sentence is quoted. For example, the entry (471) for one of the letters Emma wrote to Charles before they were married includes her statement that there are things which "if true are likely to be above our comprehension" and that "there is danger in giving up revelation." Similarly, entry 569, for the letter Darwin wrote FitzRoy in May of 1840, records, "[CD] looks back on the *Beagle* voyage as 'far the most fortunate circumstance in my life.' CD has married and has a 'little animalcule of a son.' " Entry 859 informs us that Darwin wrote Fox that he was both "flattered and unflattered" at being rumored to be the author of *Vestiges of the*

*Natural History of Creation*. Entry 3430 summarizes a letter Hooker wrote to Darwin two years after the publication of the *Origin*: "Wrote a 'frightful screed' about aristocracy being a necessary consequence of natural selection, and then burnt it."

Besides giving a list of the letters and a résumé of their content—an invaluable resource to the scholar since copies of the letters can then be obtained from either the Cambridge University Library or the American Philosophical Society in Philadelphia until such time as they appear in the *Correspondence*—what the *Calendar* does, because one is not overwhelmed by details, is to give an overview of the correspondence.

The *Calendar* makes clear that the correspondence is principally the scientific correspondence of an outstanding scientist. The entries reveal the careful preparation that went into each of Darwin's papers and books and the extensive network of informants he used. Incidentally, the *Calendar* readily allows one to estimate the magnitude of the networks of correspondents involved in Darwin's various enterprises. Thus, for the period 1847 to 1854 I counted over 150 entries summarizing letters to and from some 30 correspondents from all over the world referring to Darwin's barnacle work. There are over 1440 entries representing the Darwin-Hooker correspondence, a correspondence that surely ranks as one of the greatest of scientific exchanges. Similarly, the *Calendar* allows one to uncover easily many interesting facts. For example, there are some 2500 entries for the period from October 1821 to November 1859 and some 6000 from 1860 to 1872. For the last 10 years of Darwin's life there are over 5000 entries, with Darwin writing (on the

average) at least one letter a day during that period. The *Calendar* gives further support to Gruber's model of creativity. Darwin was the paradigm of that model: the person whose impressive effectiveness and "singular outcomes" are generated by the continual reorganization of the manifold possibilities in the pluralistic tasks that he is always working on. Even the summaries of the letters make clear how the interrelation, the intershuffling of the pluralistic activities and the transference of problems, insights, and solutions from one task to another generated new tasks and inquiries. These letters also corroborate Frank Manuel's view that geniuses are those who "in their capacity to synthesize overwhelm."

The principal beneficiaries of the *Calendar* will undoubtedly be historians of science. Anyone interested in Darwin's scientific work and the genesis of his views will be overwhelmed by what he or she will find to be waiting in the *Correspondence*. For the person interested in biographical materials, the *Calendar* indicates which letters to look to for information on Darwin's financial dealings, which to look to for insight into his relationship with his family, and so on.

The *Calendar* contains so many entries and so many that are of great interest that I clearly cannot attempt to do justice to them. The magnitude of the effort in preparing them can only be appreciated by reading the *Calendar* (or merely skimming it). It records a herculean task by devoted editors. We again are deeply in their debt.

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## Nobel Prizes: The Inaugural Era

**The Beginnings of the Nobel Institution.** The Science Prizes, 1901–1915. ELISABETH CRAWFORD. Cambridge University Press, New York, and Editions de la Maison des Sciences de l'Homme, Paris, 1984. x, 281 pp., illus., + plates. \$34.50.

Decided in secret yet invested with instant fame and fortune, the conferral of a Nobel prize serves as the highest recognition and reward by a scientist's peers and as a focus of public fascination with science. The early history of these unique science prizes, their founding, establishment, conferral, and reception in the fields of physics and chemistry

through the outbreak of World War I, is the subject of Elisabeth Crawford's pioneering study.

Although there have been sociological and statistical studies of the Nobel science prizes, no comprehensive history of the prizes was possible until 1974. In that year the Nobel Foundation and associated institutions began a policy of opening their archives for historical research on materials at least 50 years old. Crawford, a Swedish historian now working in Paris, was one of the first outside scholars admitted. She now offers the first book-length, archivally based study of the history of the prizes. The results of her

research are at the same time fascinating and somewhat disappointing: fascinating in the story that emerges, disappointing in the limitations of the archival holdings. The deliberations of the selection committees were held in such secrecy that no written records were allowed. Only the final votes and decisions were noted and passed on to the parent body, the Royal Swedish Academy of Sciences, for action. The very core of the selection process, the committee discussions, controversies, and factional disputes, is lost to history.

Yet the archival holdings, which do include the Academy deliberations, enable a much wider and deeper insight into the entire prize institution than has been possible previously, and Crawford rises to the occasion. Making full use of these and other unpublished materials, she examines the early science prizes in the context of their times, considering them in relation to late-19th-century science, faith in scientific progress, cultural nationalism, philanthropy, schools of research, academic prizes, and the needs and aims of Swedish science and scientists. Also included are accounts of Alfred Nobel (1833–1896) and his will, the drafting of the Nobel statutes (promulgated by the Swedish government in 1900), the nominator system, nominees, and winners (examined with the aid of computer analyses performed by the Office for History of Science and Technology at the University of California at



“Svante Arrhenius (1859–1927) in the Physics Institute at the Stockholm Högskola (1901).” [Photograph by Anton Blomberg, courtesy of the Stockholm City Museum; from *The Beginnings of the Nobel Institution*]

Berkeley), the reception of the prizes and prizewinners among scientists and the public, and their impact upon science itself. Certainly no work as short as this can cover all these topics in great detail. Rather than attempting to do so, Crawford offers reliable and readable accounts of each that are highly useful and accessible to historians, scientists, students, and the general public.

One of the first questions about the Nobel prizes—how they gained such prestige both within and without scientific circles—is answered, according to Crawford, largely in terms of their perceived supranationality. The seemingly

uniquely international character of these prizes, instituted as they were in an era of overblown international cultural competition, enabled them, like the gold medals handed out at the newly revived Olympic Games, to symbolize universal recognition of achievement. This unique status was attained, Crawford well demonstrates, through the extensive international networks and schools of research to which key Swedish scientists, most notably Svante Arrhenius and Gösta Mittag-Leffler, belonged. Skillfully utilizing these networks and schools, Arrhenius and Mittag-Leffler managed to mobilize large numbers of scientists from various nations as participants in the nominating process, which in turn encouraged those scientists’ support of the results. Crawford estimates that fully one-third of the scientific community participated at some stage in the process. Moreover, in picking their winners the committees were often careful to choose a candidate who would be clearly regarded by his or her peers as “worthy.” With Sweden’s official political neutrality enhancing its image of neutrality in the scientific arena, the prizes quickly became a community-wide symbol of supreme recognition and reward.

Nationalism was of course not absent. Crawford indicates that Swedish scientists did not neglect their own or Sweden’s interests in handling and conferring the annual prizes. Not only did they argue the need for new institutes (to confirm prizeworthy work), their status as bestowers of international acclaim enhanced their domestic image as “non-political” *Kulturträger*. Both interests were nevertheless pursued with remarkable restraint.

Restraint surprisingly also appears to characterize the nationalist impulses within the nominating process. Examining computer correlations between the nationalities of the many nominators and their nominees, Crawford finds only “a moderate degree of nationalism among nominators of the major powers, with the German ones showing particular restraint” (p. 104). This is harder to accept for the Germans than for the neutral Swedes, especially since possible subtleties are not examined. Crawford speculates, for example, that the expected nationalism actually lay hidden, in the case of Germany, in a kind of “scientific colonialism.” German nominators may have shown preferences for foreign scientists who had studied or conducted research in German institutions. But the idea is regrettably left unexplored.

In her analyses of the committee selection processes, Crawford convincingly



“Gösta Mittag-Leffler (1846–1927), Sweden’s best-known mathematician, in front of his palatial villa (now the Mittag-Leffler Institute) in Djursholm outside Stockholm (1907).” [Photograph by Anton Blomberg, courtesy of the Stockholm City Museum; from *The Beginnings of the Nobel Institution*]

shows the overwhelming influence of the scientific preferences of a handful of powerful Swedish scientists. Fortunately their views coincided with the majority views among their foreign colleagues. Yet in terms of numbers of nominations for individual candidates there was little clustering of "votes" and little correlation between numbers of votes and winners, save for the first few years. In the two years in which Marie Curie received her prizes, she obtained a total of only three nominations, whereas Henri Poincaré, who received numerous nominations, never did receive a Nobel prize. Instead, the determining factor on the physics committee was the majority drawn from the University of Uppsala, where physics, as was often the case elsewhere, was taken to mean experimental physics, theoretical work, well represented at the rival Högskola in Stockholm, being considered speculation. The wording of Nobel's will, establishing a physics prize for "the most important discovery or invention," could be read in favor of the Uppsala physicists. Only after World War I did they, and the physics profession at large, fully consider theoretical discoveries and inventions prizeworthy. In the chemistry committee Arrhenius and his preference for the ionist school of research predominated, although not as pervasively as did the experimentalists among their physics counterparts. Comparisons of the fields of future winners would be of interest here. Are trends such as these perceptible in later years? Further attention to the "losers," both individuals and fields, in relation both to other nominees and to those not nominated, would also be of great interest. One wonders how, in hindsight, the winners and losers compared with each other and where they stood with regard to the overall development of science in the period. Did these prizes and prizewinners really warrant the abundant prestige they bestowed and received?

Crawford does not neglect the crucial role played by the public in the establishment of the prizes and their prestige. The awarding of the prizes created a kind of symbiosis between science and the public of which the awarding bodies were probably not unmindful. The huge financial awards, endowed by the inventor of dynamite for accomplishments yielding "the greatest benefit to mankind," easily captured the public imagination. Though the other prizes (literature, medicine, peace) at first gained more attention, the award of the 1903 physics prize to Becquerel and the Curies for their work on radioactivity vastly increased the public

fascination with obscure researchers working in exotic fields on problems with unheard of implications—a fascination that has never ceased entirely. This soon translated into more financial support for science, which in turn generated more public interest in the science prizes and more approval of them among the grateful scientists. Although Crawford does not consider the issue, public fascination also tended at the same time to distort the image of scientific advance, making it appear overly individualistic, heroic, and unique—images that have also persisted. Discoveries are not always the work of one or two isolated individuals; nor is it always valid to categorize major advances in terms of Nobel-prize worthiness. One wonders whether later prize practice has taken such criticisms into account.

When Nobel laureates began to place their prestige overtly in the service of their belligerent nations in 1914, Arrhenius petitioned the Nobel Foundation to suspend the awards until the cessation of hostilities. Nobel's high ideals had obviously (then as now) not transferred to all his laureates, nor could the international prize long survive as a weapon of world warfare. The wartime hiatus provides a convenient closing to this first chapter in the history of the Nobel prizes, of which Crawford's welcome study takes wise advantage. The availability of the Nobel archives provides a major new source for the history of science in this century. Readers will eagerly await further well-argued installments based, like Crawford's, on this rich resource.

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## Reforms in the Royal Society

**All Scientists Now.** The Royal Society in the Nineteenth Century. MARIE BOAS HALL. Cambridge University Press, New York, 1984. xiv, 261 pp., illus. \$49.50.

The Royal Society has long and deservedly been much studied, but attention has focused chiefly on its founding and its first century and a half of existence. Hall's account of the Society in the 19th century is the first to cover in detail a later span of its history and is an important addition to the five official chronicles (1667, 1756, 1812, 1848, and 1944) and numerous other books and articles dealing with this oldest of scientific fellowships. Hers is a careful, well-organized, and graceful record of a cen-

tury of change and of the persons and events that brought about the orderly transformation of an influential institution into an equally commanding but modernized scientific association. Her previous work on Robert Boyle, Henry Oldenburg, and Isaac Newton has given her invaluable experience in utilizing source materials related to the Royal Society, and her familiarity with British science enables her to put it to good use in the present volume.

Changes in the Royal Society in the 19th century reflected changes in science itself, as the discipline moved from being an amateurish enterprise to becoming a highly professional activity. In 1800 the Society was at the midpoint of the 42-year-long presidency of Sir Joseph Banks, a benign and respected despot who formed organized English science into a pattern fitted for his times. Hints of change, however, began to emerge early in the century, the two most significant being the formation of new specialist societies (the Geological in 1807, the Astronomical in 1820) in fields already addressed by the Royal Society and the election, after Sir Joseph's death in 1820, of two working scientists—W. H. Wollaston (interim president, 1820) and Sir Humphry Davy—as his replacements. A contingent of active fellows, including a group of younger men, began to press for greater emphasis on science and for reforms in the selection of members and in the operation of the Society, demands that grew louder during Davy's tenure and that of his successor, the conservative Davies Gilbert.

By 1830 the reform group was sufficiently aroused to take the unusual step of contesting a presidential election. Their candidate, the astronomer John Herschel, lost by a mere eight votes to the Duke of Sussex, royal nominee of the traditionalist faction. Nonetheless, when Sussex left office in 1838 most of the changes earlier called for had been quietly and amiably effected, together with a more business-like administration of Society affairs. Under the next three presidents—the Marquis of Northampton (1838–48), the Earl of Rosse (1848–54), and Baron Wrottesley (1854–58), able men of high birth and strong scientific interests—this quiet revolution continued.

Henceforth all presidents of the Society—and there were 18 in the 19th century in contrast to eight in the 18th—were practicing scientists of outstanding reputations, the presidency customarily alternating between the biological and the physical sciences. Other offices in the Society continued to be filled by capable