"Führer" became their cherished ideology. They considered themselves a new spiritual aristocracy and longed for a social, moral, and aesthetic order in which the "part" would be mystically fused with the "whole."

For Heisenberg the youth movement became "a vehicle for his adolescent rebellion, adventurous impulses, and budding leadership qualities" (p. 65). Far more than a teen-age fancy, "pathfinding" (a phrase Cassidy takes for the title of his chapter on these activities) was a significant factor in Heisenberg's career. He had few friends outside his circle of Neupfadfinder, and even after his student years "Altmann" Heisenberg found relaxation from his quantum research in the company of his Jungstamm (the youngsters of the tribe) around the campfire. More than his own family, this circle was his true emotional home. Here he developed the attitudes he would display as an intellectual revolutionary and leader of a progressive school of modern physical theorists—and a compromising and compromised physics leader under the Nazi regime, which had no difficulty in exploiting the nationalist tendencies nurtured in this environment for its own propaganda purposes.

Heisenberg's intellectual development as a theoretical physicist and quantum mechanist is likewise illuminated by Cassidy's tracing it through a series of academic environments charged with a spirit of emulation: first, Arnold Sommerfeld's seminar in Munich, from which so many first-rate theorists sprang as if, like Argonauts, "stamped out of the ground" (to quote Einstein's admiring characterization of Sommerfeld's accomplishments as a teacher); and then the institutes of Max Born in Göttingen and Niels Bohr in Copenhagen, which were the focal points of the quantum revolution. In each of these institutes Heisenberg made his appearance following in the footsteps of Wolfgang Pauli, his Munich fellow student, friend, and competitor. Competition and rivalry, common in scientific careers, were probably nowhere so prominent as in these centers. Cassidy's account of the social and intellectual interactions among the quantum pioneers in these centers corrects the widespread romantic picture of a genial and carefree scientific comradeship. The recounting of Heisenberg's collaboration with Hendrik Anthony Kramers, who preceded him as Bohr's assistant, amply illustrates fierce rivalry between prima donnas.

Another legend Cassidy dispels has to do with the creation of matrix mechanics, commonly attributed to a stroke of genius that hit Heisenberg in summer 1925 on a barren rock in the North Sea during a recuperation from a severe attack of hay fever. Seen against the background of the enormous collaborative and competitive efforts during the preceding years in Copenhagen, Göttingen, Munich, and elsewhere, this inspiration in splendid isolation appears as just one step in a long and complicated social process that led finally to matrix mechanics. Cassidy resists the temptation to trace this process (as he did in his 1976 doctoral dissertation) in exhaustive technical detail but instead provides just enough physics to convey the main lines of thought. Readers without the competence to follow the intricate theories will be grateful for this compromise between readability and technical precision; for others the references indicate the pertinent publications. This is also the case with the treatment of other technical matters such as Heisenberg's struggle with quantum field theory and elementary particles. Here, too, readers are guided at sufficient height over a jungle of exotic physics that they can perceive the main contours without having to stumble through an impenetrable theoretical thicket.

Thus social and intellectual developments are carefully balanced and woven together into a coherent portrayal of Heisenberg's "life and science"—to the end of the Second World War, when Heisenberg was 44. The last three decades of Heisenberg's life are squeezed as a kind of epilogue into the last of the book's 27 chapters. But in view of the author's undertaking to comprehend Heisenberg from the perspective of his formative environments, such a chronologically skewed biography is a tolerable compromise. The same scrutiny of sources could not readily have been extended with the same degree of accuracy to all periods of Heisenberg's life, and the context of German science changed so much after the war that another volume would be needed to embed Heisenberg in this new environment as neatly as is done here for the earlier periods. The thoroughness with which Cassidy has approached the earlier periods, in particular with regard to the Third Reich, was necessary in view of the "profound failure by Heisenberg and others to be completely candid about their attitudes during Hitler's rule and especially during the war" (p. 521). Given the controversies that have surrounded Heisenberg's attitudes during the Nazi period, Cassidy's judicious account is most welcome as an authoritative and reliable reference.

Beyond the interest attaching to Heisenberg himself, this biography deserves attention for yet another reason. Biographers of scientists usually portray their subjects more from the perspective of scientists or scientific journalists than of historical scholars. Cassidy's *Uncertainty*, bringing a professional historical approach to its subject, is a powerful demonstration of the potential of social history in scientific biography.

MICHAEL ECKERT
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"Nobelists and family members at the Stockholm train station, 1933." From right, Erwin Schrödinger, Werner Heisenberg, Paul Dirac, Dirac's mother, Schrödinger's wife, Heisenberg's mother. [From *Uncertainty: The Life and Science of Werner Heisenberg*]

Italians on Evolution

Darwin in Italy. Science Across Cultural Frontiers. GIULIANO PANCALDI. Indiana University Press, Bloomington, 1991. xvi, 222 pp. $35. Translated with revisions from the Italian edition (Bologna, 1983) by Ruey Brodine Morelli.

Italy was an important meeting place for mid-19th-century writers and thinkers from all parts of Europe. After unification it offered an opportunity for scientists in exile from Germany, France, and Russia, as it had

offered a breathing place to literary writers some 40 years before. But it also developed its own traditions, sometimes reflecting and reacting to various European trends, sometimes developing an independent viewpoint.

In *Darwin in Italy* Pancaldi has chosen to look at Italian scientists, rather than exiles living in Italy, and to demonstrate how the science of a selected group of scientists either influenced or was influenced by Charles Darwin. Different concerns of Darwin's are chosen, ranging from the species question to human social evolution. Some of the scientists Pancaldi has singled out were natural historians to whom Darwin responded, either by establishing a correspondence with them or by incorporating criticisms or arguments from their thought into his writings. Defining "Darwin in Italy" in this manner means that this book does not detail the variety of scientific institutions and scientists in Italy at this period who considered themselves "Darwinists." Pancaldi is rather suspicious of this term, with some justification given the wide interpretation it has been given.

The first group of scientists Pancaldi discusses is from the pre-Darwinian period. Some are not even evolutionists, but in many ways this is the best part of the book. Giambattista Brocchi, described as a "geologist and naturalist," was a significant figure who endorsed Cuvier's concept of species extinction but denied its direct relationship to the history of the earth. He believed, as the geologist Charles Lyell came to believe, in cycles of nature. His influence on Darwin, according to Pancaldi, came only through Lyell, who acknowledged a significant debt to him.

Pancaldi continues with an examination of other scientists who took up the evolutionary questions in Italy before Darwin and debated Cuvier's attack on Lamarck and Geoffroy Saint-Hilaire. He investigates other scientific events in the 1840s and 1850s before Darwin, including the rise of a strong group of dedicated Lamarckians. One of these is of special interest, Filippo De Filippi, professor of zoology at Bologna and then Turin, later one of the first scientists to lecture on Darwinism.

Only by the third chapter, halfway through the book, does Pancaldi finally introduce us to those scientists who translated or commented on Darwin's books. Here Pancaldi seems to have made the decision not to overlap with the other major pieces of Italian scholarship on 19th-century Darwinism. As a result, we are given detailed evidence of De Filippi's Lamarckian ideas but are told too little about him in the post-Darwinian period. We are told only that his interest in Darwinism led him to make the first lengthy analysis of Darwin and human evolution in Turin in 1864 while attempting to bring his Catholic faith and science together. The reader is given no sense of what kind of reaction and response to De Filippi existed in Italy.

Pancaldi does offer a very helpful and detailed description of Darwin's Italian translator Giovanni Canestrini. The translation appeared only in 1864, the same year Russian and Dutch translations were published. Canestrini, who was assisted by Leonardo Salimbeni, declared that they wanted to produce a translation without the failings of the German and French translations. The French version, most frequently read by Italians, contained a startling anticlerical preface written by the translator Clémence Royer, which suggested applications of Darwinian evolution to human society. Canestrini and Salimbeni abjured Royer's version, which, they believed, provided "untimely annotations" to Darwin's theory "in many points erroneous and generally too free and imprecise." Nevertheless, as Pancaldi shows, they relied upon the French version for some of the language used in the translation, adopting "natural election" instead of "natural selection" for some of the same reasons Royer adopted this usage. Yet Pancaldi, while showing the retention of other terms introduced in the French translation, ignores the possibility that the concept of progressive evolution to which Canestrini adhered may have derived from this translation. He also seems unaware of the presence of Royer in Italy, although she lectured in major cities of Italy during the crucial period 1864–1869.

Pancaldi illuminates the work of the botanist Federico Delpino, the first Italian writer whom Darwin greeted with enthusiasm. Delpino was one of the few scientists in Europe who debated pangenesis, Darwin's hereditarian theory, with him. Perhaps in an effort to show that he could be interpreted as a non-materialist, Darwin published a translation of Delpino's analysis of pangenesis, which made teleological as well as vitalistic claims, appending his own reply.

Toward the end of his book, Pancaldi discusses Cesare Lombroso's *Criminal Anthropology* and its possible links to Darwinism. It is not clear to me why he has included Lombroso, unless it is because his name has the broadest recognition outside Italy. His inclusion violates the book's premise that only Italian scientists debating, affecting, or interacting with Darwin would be discussed. Pancaldi himself holds that Lombroso's invocation of atavism as an explanation for criminal behavior relates as much to Morel's degeneracy theory as to Darwinism. He argues with some justice that both Darwin and Lombroso were responding to a common culture of "scientific naturalism." But he gives no reaction of other supporters of Darwin in Italy to the

Vignettes: Responsibilities to Students

Colleges and universities have *students*, whose role is different from that of the customers of a supermarket. It is inappropriate to say to students . . . *caveat emptor.*

—Rudolph H. Weingartner, in *Morality, Responsibility, and the University* (S. M. Cahn, Ed; Temple University Press)

Visitation rules are accorded a few paragraphs in my university's handbook, compared to the policy on "extension cords in residence halls," which covers three columns, encompassing a statement of purpose and fourteen numbered subsections.

One might argue that a responsible parent is no less concerned with proper use of extension cords than with personal and sexual conduct. Perhaps statistical evidence would even show that more students suffer lasting injury from use of substandard extension cords . . . than from casual sex. But the hands-off policy of the handbook that expresses disapproval of cohabitation but leaves visiting restrictions to majority vote of each residential building is a far cry indeed from the traditional stance of the institution as surrogate parent.

—David A. Hoekema, in *Morality, Responsibility, and the University*

I conclude . . . that the activity of friendship, for all its intrinsic value, is morally out of bounds for professors where actual and potential students are concerned.

—Peter J. Markie, in *Morality, Responsibility, and the University*

rather aberrant evolutionism of Lombroso. A tantalizing incompleteness characterizes the rather brief discussion of race theory and popular views of evolution with which Pancaldi ends his book.

The greatest virtue of Pancaldi's book is that he has discussed the science of the individuals he has chosen, as well as their adherence to evolutionism. Yet the book leaves one with the sense of a story only partially told. At the time it was originally published in Italy a number of books and articles had appeared on Italian Darwinism that discussed European scientists living in Italy as well as the Italians. Pancaldi carefully placed his own book in the center of these studies, filling in the gaps in the scholarship and leaving out other parts adequately covered. The pity is that he does not share this careful placement with his English readers, even though his introduction and footnotes attempt to update and supplement the text and refer the reader to subsequent writings. As a result, the real "Darwin in Italy" cannot be viewed through this book, although every contribution to a larger picture of European Darwinism must be greeted with interest and care.

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Books Received

Advances in Finite Geometries and Designs. J. W. P. Hirschfeld, D. R. Hughes, and J. A. Thas, Eds. Oxford University Press, New York, 1991. x, 428 pp., illus. $69. From a conference, Chelwood Gate, East Sussex, U.K., July 1990.

Advancing Toward Closed Models of Forest Ecosystems. Merrill R. Kaufmann and Joseph J. Landsberg, Eds. Heron, Victoria, Canada, 1991. xii, 324 pp., illus. $66. Tree Physiology, vol. 9 (1 and 2). From a workshop.

AIDS and the Hospice Community. Madalon O'Rawe Amenta, Ed. Harrington Park (Haworth), New York, 1992. xii, 197 pp. $24.95; paper, $14.95. Also published as *The Hospice Journal*, vol. 7, no. 1/2, 1991.

AIDS and the Social Sciences. Common Threads. Richard Ulack and William F. Skinner, Eds. University Press of Kentucky, Lexington, 1991. xiv, 177 pp., illus. $21. From a symposium, Lexington, KY, Oct. 1989.

AIDS Clinical Review 1991. Paul Volberding and Mark A. Jacobson, Eds. Dekker, New York, 1991. xviii, 232 pp., illus. $110.

Alfred Russel Wallace. An Anthology of his Shorter Writings. Charles H. Smith, Ed. Oxford University Press, New York, 1991. x, 551 pp. $79.

Bacterial Genetic Systems. Jeffrey H. Miller, Ed. Academic Press, San Diego, CA, 1991. xxx, 706 pp., illus. $95. Methods in Enzymology, vol. 204.

The Bats of Texas. David J. Schmidly. Drawings by Christine Stetter. Texas A&M University Press, College Station, 1991. xviii, 189 pp., illus., + plates. $34.50; paper, $19.95.

The Biochemical Basis of Neuropharmacology. Jack Cooper, Floyd E. Bloom, and Robert H. Roth. 6th ed. Oxford University Press, New York, 1991. x, 454 pp., illus. $45; paper, $24.95.

Biochemical Protozoology. Graham H. Coombs and Michael J. North, Eds. Taylor and Francis, Washington, DC, 1991. xx, 635 pp., illus. $88; paper, $44.

Biochemistry of Copper. Maria C. Linder with a contribution by Christina A. Goode. Plenum, New York, 1991. xiv, 525 pp., illus. $89.50. Biochemistry of the Elements, vol. 10.

The Biological Chemistry of the Elements. The Inorganic Chemistry of Life. J. J. R. Fraústo da Silva and R. J. P. Williams. Clarendon (Oxford University Press), New York, 1991. xxii, 561 pp., illus. $75.

Cancer, HIV and AIDS. V. Beral, H. W. Jaffe, and R. A. Weiss, Eds. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1991. x, 171 pp., illus. $60. Cancer Surveys, vol. 10.

Chemical Reactions in Complex Mixtures. Ajit V. Sapre and Frederick J. Krambeck, Eds. Van Nostrand Reinhold, New York, 1991. xx, 328 pp., illus. $57.95. From a workshop, Paulsboro, NJ, 1990.

Chemical Synthesis of Advanced Ceramic Materials. David Segal. Cambridge University Press, New York, 1991. xvi, 182 pp., illus. $65; paper, $24.95. Chemistry of Solid State Materials. Reprint, 1989 ed.

The Chemical Synthesis of Peptides. John Jones. Clarendon (Oxford University Press), New York, 1991. x, 228 pp., illus. $75. International Series of Monographs in Chemistry, 23.

Chemotactic Cytokines. Biology of the Inflammatory Peptide Supergene Family. J. Westwick, I. J. D. Lindley, and S. L. Kunkel, Eds. Plenum, New York, 1991. xiv, 186 pp., illus. $65. Advances in Experimental Medicine and Biology, vol. 305. From a symposium, London, June 1990.

Clifford Algebras and Dirac Operators in Harmonic Analysis. John E. Gilbert and Margaret A. M. Murray. Cambridge University Press, New York, 1991. viii, 334 pp. $75. Studies in Advanced Mathematics, 26.

Coaching Science Stars. Pep Talk and Play Book for Real-World Problem Solving. Robert C. Barkman. Zephyr, Tucson, AZ, 1991. iv, 162 pp., illus. Paper, $17.95.

Death in the Marsh. Tom Harris. Island Press, Washington, DC, 1991. xvi, 245 pp. $24.95; paper, $14.95.

Dictionary of Scientific Literacy. Richard P. Brennan. Wiley, New York, 1992. xvi, 334 pp., illus. $22.95. Wiley Science Editions.

Directed Mutagenesis. A Practical Approach. M. J. McPherson, Ed. IRL (Oxford University Press), New York, 1991. xx, 257 pp., illus. $55; paper, $35. The Practical Approach Series.

The Disappearance of Time. Kurt Gödel and the Idealistic Tradition in Philosophy. Palle Yourgrau. Cambridge University Press, New York, 1991. x, 182 pp., illus. $39.50.

Diversity in the Genus *Apis*. Deborah Roan Smith, Ed. Westview, Boulder, CO, and Oxford and IBH, New Delhi, 1991. xiv, 265 pp., illus. $58. Studies in Insect Biology. Based on a conference, 1989.

The Egalitarians—Human and Chimpanzee. An Anthropological View of Social Organization. Margaret Power. Cambridge University Press, New York, 1991. xx, 290 pp., illus. $44.95.

Elementary Physicochemical Processes on Solid Surfaces. V. P. Zhdanov. Plenum, New York, 1991. xii, 314 pp., illus. $85. Fundamental and Applied Catalysts. Translated from the Russian.

Encyclopedia of Earth System Science. William A. Nierenberg, Ed. Academic Press, San Diego, CA, 1991. 4 vols. Vol. 1, xii, 663 pp., illus., + plates. Vol. 2, x, 687 pp., illus. Vol. 3, x, 760 pp., illus., + plates. Vol. 4, x, 715 pp., illus., + plates. The set, $950.

Enzyme Handbook, 4. Class 3: Hydrolases. D. Schomburg and M. Salzmann, Eds. Springer-Verlag, New York, 1991. Variously paged. In looseleaf binder, $179.

Ethnography Unbound. Power and Resistance in the Modern Metropolis. Michael Burawoy *et al.* University of California Press, Berkeley, 1992. x, 352 pp. $39.95; paper, $14.95.

Female and Male in Borneo. Contributions and Challenges to Gender Studies. Vinson H. Sutlive, Jr., Ed. Department of Anthropology, College of William and Mary, Williamsburg, VA, 1991. xlvi, 528 pp., illus. $30. Borneo Research Council Monograph Series.

Fifty Years Among the New Words. A Dictionary of Neologisms, 1941–1991. John Algeo, Ed. Cambridge University Press, New York, 1991. x, 257 pp. $60. Centennial Series of the American Dialect Society. Reprinted from *American Speech*, vols. 16–65 (1941–1990).

Galápagos Marine Invertebrates. Taxonomy, Biogeography, and Evolution in Darwin's Islands. Matthew J. James, Ed. Plenum, New York, 1991. xiv, 474 pp., illus. $95. Topics in Geobiology, vol. 8.

The Geography. Claudius Ptolemy. Dover, New York, 1991. xvi, 167 pp., illus., + plates. Paper, $19.95. Translated from the Greek by Edward Luther Stevenson. Reprint, 1932 ed.

Geraghty and Miller's Groundwater Bibliography. Frits van der Leeden, Ed. 5th ed. Water Information Center, Plainview, NY, 1991. xii, 507 pp. Paper, $69.95. Environmental Science and Engineering Series.

Gestures and Speech. Psychological Investigations. Pierre Feyereisen and Jacques-Dominique de Lannoy. Cambridge University Press, New York, and Maison des Sciences de l'Homme, Paris, 1991. viii, 210 pp. $42.50. Studies in Emotion and Social Interaction.

Glasses and the Vitreous State. J. Zarzycki. Cambridge University Press, New York, 1991. xviii, 505 pp., illus. $125. Cambridge Solid State Science Series, 9. Translated from the French edition (Paris, 1982) by William D. Scott and Claire Massart.

Global Ecology. Colin Tudge. Oxford University Press, New York, 1991. x, 173 pp., illus. $29.95.

The Handbook of Infrared and Raman Characteristic Frequencies of Organic Molecules. Daimay Lin-Vien *et al.* Academic Press, San Diego, CA, 1991. xviii, 503 pp., illus. $89.95.

Hans Popper. A Tribute. Paul D. Berk, Fenton Schaffner, and Rudi Schmid, Eds. Raven, New York, 1991. xii, 179 pp. + plates. $50. Forty papers honoring the memory of the "father of the modern discipline of hepatology."

Healing and Society in Medieval England. A Middle English Translation of the Pharmaceutical Writings of Gilbertus Angelicus. Faye Marie Getz, Ed. University of Wisconsin Press, Madison, 1991. lxxvi, 378 pp. $37.50.

The Hidden War. Jane C. Ebbs. Pentland, Edinburgh, 1991. xii, 129 pp., illus. £ 14.50.

How the Shaman Stole the Moon. In Search of Ancient Prophet-Scientists from Stonehenge to the Grand Canyon. William H. Calvin. Bantam, New York, 1991. xvi, 223 pp., illus. $21.50.

Inclusion Compounds. Vol. 4, Key Organic Host Systems. J. L. Atwood, J. E. D. Davies, and D. D. MacNicol, Eds. Oxford University Press, New York, 1991. xvi, 511 pp., illus. $98.

The Interacting Boson-Fermion Model. F. Iachello and P. Van Isacker. Cambridge University Press, New York, 1991. x, 312 pp., illus. $75. Monographs on Mathematical Physics.

Interaction of Charged Particles with Solids and Surfaces. Alberto Gras-Marti *et al.*, Eds. Plenum, New York, 1991. xii, 716 pp., illus. $150. NATO Advanced Science Institutes Series B, vol. 271. From a meeting, Alacant, Spain.

The International Chernobyl Project. Assessment of Radiological Consequences and Evaluation of Protective Measures. International Atomic Energy Agency, Vienna, 1991 (U.S. distributor, UNIPUB, Lanham, MD). viii, 93 pp. Paper, $35. From a conference, Vienna, May 1991.

An Introduction to Tropical Rain Forests. T. C. Whitmore. Oxford University Press, New York, 1991. xii, 226 pp., illus. Paper, $35.

Islands, Plants, and Polynesians. An Introduction to Polynesian Ethnobotany. Paul Alan Cox and Sandra Anne Banack, Eds. Dioscorides (Timber Press), Portland, OR, 1991. 228 pp., illus. $34.95. From a symposium, Laie, HI.

Landau Fermi-Liquid Theory. Concepts and Applications. Gordon Baym and Christopher Pethick. Wiley Interscience, New York, 1991. viii, 203 pp., illus. $49.95.

Landscapes of Emotion. Mapping Three Cultures of Emotion in Indonesia. Karl G. Heider. Cambridge University Press, New York, and Maison des Sciences de l'Homme, Paris, 1991. xvi, 332 pp., illus. $44.50. Studies in Emotion and Social Interaction.

Lectures on Non-Perturbative Canonical Gravity. Abhay Ashtekar. World Scientific, Teaneck, NJ, 1991. xx, 334 pp., illus. $86; paper, $48. Advanced Series in Astrophysics and Cosmology, vol. 6.

Men and Whales. Richard Ellis. Knopf, New York, 1991. xvi, 542 pp., illus. $40.

The Meson Factories. Torleif E. O. Ericson, Vernon W. Hughes, and Darragh E. Nagle. University of California Press, Berkeley, 1991. x, 861 pp., illus. $75. Los Alamos Series in Basic and Applied Sciences, vol. 11. A collection of reprinted articles (to 1989), with commentary.

Methods for Assessing Exposure of Human and Non-human Biota. Robert G. Tardiff and Bernard D. Goldstein, Eds. Published on behalf of the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions by Wiley, New York, 1991. xiv, 417 pp., illus. $175. SCOPE 46. From a workshop, Mexico City, Aug. 1985.

Methods in Neurosciences. P. Michael Conn, Ed. Vol. 7, Lesions and Transplantation. Academic Press, San Diego, CA, 1991. xviii, 496 pp., illus. Spiral