

## Coming Together: History of Economics as History of Science

Margaret Schabas

At the other extreme is the antihistorical school, which is now common in the United States, where the history of thought is regarded as a slightly depraved entertainment, fit only for people who really like medieval Latin, so that one can become a full-fledged chartered Ph.D. economist without ever reading anything that was published more than ten years ago.

—Kenneth Boulding, "After Samuelson, Who Needs Adam Smith?"

(1971)

If one revisits the early years of *History of Political Economy*, one cannot help but be struck with the impression that the field was already very much on the retreat. Kenneth Boulding (1971, 232–33) deplores the lack of historical thinking in the education of American economists; A. W. Coats (1969, 9) observes that the pressures of government and business have rendered the history of economics into "an unnecessary luxury or, more frequently, . . . a wasteful diversion of time and energy." Their complaints have withstood the tests of time. While the history of economics, at least in American universities, is often recommended if not required for undergraduate students of economics, most graduate students never take a course in the subject. The history of economics is more deeply woven into the curriculum in France, the Netherlands, and

I would like to thank Simon Schaffer for some important feedback. Others have helped with factual information: Steve Medema, Bernard Cohen, Esther-Mirjam Sent, Noretta Koertge, Margaret Rossiter, Margaret Osler, Jay Malone, Tim Alborn, Tom Broman, and Paul Dudenhefer. I owe special thanks to Sheila Dow and Roy Weintraub, who helped me with retrieval difficulties in the midst of relocating.

Japan, for example, but the situation in the United States is unlikely to improve anytime soon. Research in the field, however, has grown, in that there are more journals, more books, and more active scholars than ever before. But the economics profession has grown as well, such that our constituency in the profession is at best 1 percent.<sup>1</sup>

Adaptation is often the key to survival. It will come as no surprise for those who are already familiar with my work that I am a keen advocate of treating the history of economics as a branch of the history of science. Some articles in *History of Political Economy*, for example those by Paul Christensen (1989), Salim Rashid (1981), and Richard Romano (1982), had already begun to steer the subject in that direction. These were followed by some books that linked the two fields, notably Ingrao and Israel 1987, Mirowski 1989, and Schabas 1990. And since I published my "Breaking Away" manifesto in 1992, many more works have appeared that draw firm connections between the history of economics and the history of science.<sup>2</sup> The most notable contribution in this respect is Philip Mirowski's edited volume, Natural Images in Economic Thought (1994), which included articles by such prominent historians of science as I. Bernard Cohen, Ivor Grattan-Guinness, Sharon Kingsland, Camille Limoges, and Theodore Porter. Other monographs in this vein are those by Robert B. Ekelund Jr. and Robert F. Hébert (1999), James Henderson (1996), Judy Klein (1997), and Deborah Redman (1997). Historians of economics have also published numerous articles in mainstream history of science journals such as Isis, Science in Context, and Studies in the History and Philosophy of Science. See, for example, the articles by Sergio Cremaschi and Marcelo Dascal (1998), Robert Dimand (1993), Francesco Guala (2001), Bruna Ingrao (1994), Gérard Jorland (1996), Robert Leonard (1998), Harro Maas (1999), Uskali Mäki (1997), Philip Mirowski (1992b, 1999), Bert Mosselmans (1998), Mary Morgan (1997), Esther-Mirjam Sent (2001), and Yuval Yonay (1994).<sup>3</sup>

- 1. My estimate is based on the following statistics. There are about three hundred active scholars in the history of economics in North America, and about thirty thousand members of the American Economic Association and Canadian Economic Association combined. Of course there are many more economists in America, easily one hundred thousand who adopt the title, but a more limited number are academic economists and thus form the relevant comparison group. In 1983, De Marchi and Lodewijks (334) observed that the publication rate of articles in history of economics had grown linearly, but the economics literature over the past twenty years had grown exponentially.
  - 2. A provocative follow-up can be found in Emmett 1997.
- 3. There are also some examples that precede 1992. See, for instance, Gordon 1989, Hollander 1983, and Schabas 1989.

As a frequent attendee at history of science gatherings, I have formed the impression that the history of economics is no longer viewed as a deviant pursuit. A cluster of collected volumes appeared circa 1990 that included one or more articles on the history of economics, notably Patrick Brantlinger's Energy and Entropy (1989) (with an article by the present author), I. Bernard Cohen's *The Natural Sciences and the Social Sciences* (1994) (Camille Limoges, Giuliano Pancaldi, Margaret Schabas, and S. S. Schweber), Tore Frängsmyr's Science in Sweden (1989) (Sven-Eric Liedman), Tore Frängsmyr, John Heilbron, and Robin Rider's *Quantify*ing Spirit in the Eighteenth Century (1990) (Karin Johannisson, Svante Lindqvist, and Henry E. Lowood), and Lorenz Krüger, Gerd Gigerenzer, and Mary S. Morgan's Probabilistic Revolution (1987) (Gérard Jorland, Claude Ménard, and Mary Morgan). The tide changed most explicitly, however, with the work of three prominent historians of science: Theodore Porter (1986), Norton Wise (1989–90), and Simon Schaffer (1989, 1994). This was in part due to the shift by historians of science toward what has come to be known as cultural history. The abandonment of a strict "internalist" history of science in the 1970s of the sort exemplified by Alexandre Koyré (1965) led to a strong emphasis on institutional factors in the development of science as, say, in the work of Jack Morrell and Arnold Thackray (1981). But this tended to neglect the actual content of scientific theories, and in dialectical fashion, there was an effort to restore the play of ideas while also drawing links to the broader social setting of science. Some leading exponents of this are Lorraine Daston, Ian Hacking, and Bruno Latour. But perhaps what most consolidated the presence of economics was the appreciation of standardization in the history of science literature, spearheaded by Porter, Wise, and Schaffer. That commercial interests spawned the motifs of precision and objectivity in science is music to the ears of those who believe that science is deeply political. This is most exemplified by Theodore Porter's Trust in Numbers (1995), Norton Wise's collection Values of Precision (1995), and Michael Power's Accounting and Science (1996). Other examples of this appreciation for applied economics and its implications for standardization are, for example, Judith Grabiner 1998, Svante Lindqvist 1990, and James Sumner 2001.

By the mid-1990s, history of economics had become part of mainstream history of science. Indeed, prizes from the History of Science Society for the best book and *Isis* article, respectively, went to works that explicitly link economics to other sciences, Pamela Smith's *Business of*  Alchemy (1994) and William Ashworth's (1996) essay on Charles Babbage and John Herschel. Other noteworthy monographs of the past ten years that feature economic ideas in their treatment of the history of the natural sciences are Joel Kaye 1997, Lisbet Koerner 1999, and Jean-Pierre Poirier 1993. Recent articles on the history of economics that are in either edited volumes or journals in the history of science are Timothy Alborn 1996, Myles Jackson 1994, Gérard Jorland 2000, Norriss Hetherington 1993, Jessica Riskin 1998, Andrea Rusnock 1999, Margaret Schabas 1997, Emma Spary 1996, Sylvana Tomaselli 1995, and Norton Wise 1993. And the recent volume on models, edited by Mary S. Morgan and Margaret Morrison (1999), has highlighted yet another point of intersection between the natural sciences and economics.

A more minor objective on my part has been to promote the name history of economics in lieu of the history of economic thought, as a way to both mimic other branches of the history of science and help steer our field away from its internalist orientation. So if one can extrapolate even from the title of the 2001 HOPE conference, there is cause for optimism. Not only has the simplified name for our pursuit gained greater currency, but it is evident from the list of citations just given that the history of economics has drawn considerably more ties with the history of science since 1992, and vice versa. If one looks to leading textbooks in the history of economics—for example, Mark Blaug (1997) and Henry Spiegel (1991)—one finds a longstanding recognition of the ideas of Thomas Kuhn and Imre Lakatos. For what it is worth, Joseph Schumpeter's great tome (1954) drew extensive connections to the history of science. More significantly, one can now find readings on the history of economics in a number of history of science graduate courses, such as those offered at Princeton (with readings from Michael Mahoney), University of Toronto (Sungook Hong), University of Wisconsin (Tom Broman), University of California, Los Angeles (Ted Porter and Norton Wise), and Cambridge (Simon Schaffer), to note only a few. Philip Mirowski's More Heat Than Light (1989) is widely read among historians of science, as is the collection of articles edited by Neil De Marchi (1993) that attempt to make sense of it.

The links between the history of economics and the history of science, at least in the Anglo-American world, are longstanding. Economics has had a constant though relatively minor presence in the discourse of the history of science since its earliest professional days (Isis was founded in 1912; the History of Science Society was founded in 1924),

and a marked increase in recognition has transpired in the past two or so decades. Given the relatively secure status of the history of science profession in the academic world, I will argue that historians of economics could only benefit from closer ties to this larger group of scholars. Moreover, one of the factors that brought about the success of the history of science as a discipline was its emancipation from the science professions. By developing their own disciplinary methods and standards, historians of science are able to speak to themselves and thus cultivate stronger disciplinary boundaries.

Interestingly, some of the leading contributors to economics of the distant past also wrote on history of science. One might make that case even for Aristotle, who, relative to his contemporaries, provided historical overviews on various sciences. But that would be stretching matters more than is warranted. Certainly, however, the case can be made for Adam Smith (1980), whose essays on the history of astronomy and the history of ancient physics are some of the very best accounts of the time. During the nineteenth century we find several eminent economists writing on the history of science, namely William Whewell, John Stuart Mill, A. A. Cournot, and William Stanley Jevons. Jevons even attempted to chronicle the development of mathematical economics, resulting in the unprecedented effort to do both history of science and history of economics. But these were done more or less in separation from one another. It is only in the twentieth century that historians of science began to include economics in a systematic manner.

Historians of economics have undoubtedly been the poorer cousins among professional historians of science, the ones, as Thomas Robert Malthus would have put it, who were left out at nature's feast. In the formative years of the history of science, say, from 1915 to 1960, the thing to do was the history of the exact sciences, namely, mathematics, physics, and astronomy. Even the history of chemistry suffered from the aspersions of "sooty empiricism" once cast by Descartes. Until about 1960, as Thomas Kuhn (1977, 111) recognized, the number of American academics appointed explicitly as historians of science was scarcely more than half a dozen. Only then did the subject begin to grow professionally and make its way into the core curriculum of many universities. The histories of the life sciences and of psychology had received relatively short shrift up until that time but began to gain a full-fledged identity with the introduction of the *Journal of the History of the Behavioral Sciences* (1965) and the *Journal of the History of Biology* (1968). These

publications commenced in tandem with the formation of our cherished and beloved *HOPE* (1969). Nevertheless, it is possible, within this Comtean hierarchy, to discern the presence of the history of economics right from the very start. In other words, it had a toehold in the history of science world, even if it did not have the level of general acceptance that has come about in the past two decades.

To provide some evidential support to these impressions, I perused the Dictionary of Scientific Biography (Gillispie 1970) to see if the science of economics had made any entries.<sup>4</sup> To my surprise, my recent survey yielded several entries that acknowledged contributions to economics, including William Petty, Anne-Robert-Jacques Turgot, David Hume, Jevons, and John Maynard Keynes (Karl Marx and Friedrich Engels appear in the supplementary volume of 1978). Moreover, economics was explicitly recognized in the subheadings that listed scientific contributions. Some, such as John Locke, Étienne Bonnot de Condillac, and the Marquis de Condorcet, had entries, but no mention was made of their interests in economics. Others, such as Adam Smith, Léon Walras, and Irving Fisher, were omitted altogether. A couple of prominent chemists, Antoine Lavoisier and Frederick Soddy, had their writings on economics acknowledged in their articles, but not in the front set of scientific specialties.

The fact that the first list could have economics featured in the description of scientific pursuits after those names shows that economics was not entirely neglected even if it did not figure prominently at the time. As the general editor, Charles C. Gillispie, made clear in the preface, those in the behavioral and social sciences were included only in the instances of persons whose work was intrinsically related to the sciences of nature or to mathematics. Turgot was listed as a contributor to economics and philosophy, Hume to philosophy, economy, political theory, and history. Turgot was included, however, for his work on the theory of vapors, which was of seminal importance in the so-called chemical revolution. No doubt Hume made an appearance because of his later influence on logical positivism and on Albert Einstein.

It is worth noting that Gillispie, the dictionary's editor-in-chief, is himself one of the first historians of science to write about the work of economists. His Genesis and Geology (1951), drawing heavily on the

<sup>4.</sup> As graduate students in the history of science at the University of Toronto, we were encouraged to commit the entire dictionary (fifteen volumes) to memory, but of course I failed on that score.

work of Élie Halévy, made numerous references to Victorian economists such as Thomas Chalmers. His 1957 *Isis* article, "The Natural History of Industry," referred to the role of the physiocrats, and his celebrated *Edge of Objectivity* (1960) drew connections to classical political economy, notably the ideas of Adam Smith and Malthus. One of the best examinations of the economic work of Lavoisier and Turgot can be found in his more recent study, *Science and Polity in France at the End of the Old Regime* (1980). Not by accident, one of Gillispie's most famous students, Theodore Porter, has championed the presence of economics in mainstream history of science since he began to publish in the early 1980s.

To gain a better understanding of the presence (or absence) of the history of economics within the history of science world I decided to look closely at the contents of *Isis*, from its formation in 1912 up to the time of Thomas Kuhn's landmark work, *The Structure of Scientific Revolutions* (1962). Not only has *Isis* retained its standing as the journal of choice for historians of science right up to the present (its subscription level is close to four thousand), but it also provides an annual critical bibliography, which scans hundreds of books and journals that might pertain to the history of science (*HOPE*, alas, was only entered into its charts in 1979). Each issue also provides commentaries, news about the profession, and *éloges*.

Isis was founded by George Sarton, a Belgian scholar, in 1912, shortly before the Great War. It originally published articles in numerous languages, not only French, English, and German, but also Greek and Arabic. Volume 1 actually appeared in 1913 and explicitly recognized "les sciences sociologiques." There were also articles on the history of art, music, ethnology, and geography. The first issue of volume 2 appeared in 1914, but no more appeared until the war had ended. The remaining part of volume 2 appeared in 1919, and volume 3 spanned the years 1920-21, delayed by Sarton's move to Harvard. In 1920, Sarton announced in a preface that the journal would henceforth publish exclusively in English. With a passionate plea for universal humanism, Sarton deemed English the language of hope and democracy, because it belonged to the many countries that had brought peace and freedom back to the world. Interestingly, Émile Durkheim was on the original "comité de patronage" of thirty-two men, along with other eminences such as Jacques Loeb and Henri Poincaré. But in fact Sarton alone put the journal together for many years. He never issued another patronage committee, and not until

his student I. Bernard Cohen took over in 1953 did the journal appear to be run by more than one person. Cohen worked together with a four-man advisory board.5 An editorial committee of seven scholars was listed for the first time in 1969! That is a considerable period of time for a journal to be run so autocratically.

Sarton's approach to the history of science was anything but narrow. In volume 3, his opening article was on Herbert Spencer, who was best known for his work on philosophy, psychology, and social Darwinism (Sarton 1921, iii). In volume 5 of Isis, Sarton's (1923, 2) opening remarks construed the field of history of science as broadly as possible: "The history of science is essentially a story of human achievement. ... The task of the historian should not be restricted to the more technical aspect of scientific discovery." In volume 23, he featured Adolphe Quetelet on the centenary of his Sur l'homme (1835), which Sarton (1935, 6) deemed "one of the greatest books of the nineteenth century." He traced Quetelet's work back to the political arithmetic of William Graunt, William Petty, and Edmund Halley. These are just some indications that Sarton, at least, did not confine the field to mathematics, physics, and astronomy, even though these were the areas of his most celebrated research.

Sarton included a critical bibliography (bibliographie analytique) at the end of each issue from the very start. Indeed, *Isis* appears to have grown out of his efforts to catalog scholarship in the history of science. There were entries for the subjects of psychologie (section 18), sociologie et politique positive (section 19), and anthropologie. But these sections, grouped under the broader rubric of sciences sociologiques, only occupied about one-half of a page, much less than the other four categories of mathematics, physical sciences, biological sciences, and medical sciences. Under section 19 in volume 1 (issue 3) are two entries, one of which reads, "Charles Gide et Charles Rist, Histoire des doctrines économiques depuis les physiocrates jusqu'à nos jours, 2e ed." By volume 3 (1920-21), there is a separate heading for economics (number 11), with seven entries in the first issue, including the English translation of Gide and Rist and the new and enlarged edition of John Kells Ingram, A History of Political Economy. At this point, Sarton arranged the subheadings alphabetically, so economics came between

<sup>5.</sup> Robert Multhauf (1975, 461) calls this group an "editorial board," with Cohen as the "chief editor."

*chemistry* and *education*. But the entries for economics mostly pertained to economic history, presumably because of its relevance for the history of technology.

There are three entries on economics in the critical bibliography of volume 5, including a short pamphlet by the distinguished chemist Frederick Soddy entitled "Cartesian Economics." In subsequent volumes, there are a number of additional entries to the category of economics (number 11 of part 3, following number 9 for botany and number 10 for chemistry), although in most years the entries average two or three listings. For volume 8, the number of subsections had greatly expanded, such that economics became number twenty-eight, immediately after superstition (number 27)! "Superstition and the Occult" had been a separate heading from the start, but Sarton appears to have imposed a Comtean hierarchy in place of the earlier alphabetical format. Both belonged to the broader category of anthropological and historical sciences ("Knowledge of Man, Past and Present") for several volumes thereafter, and economics came to reside fairly permanently as number 42, sandwiched between "Superstition and Occultism" (number 41) and "Sociology, Jurisprudence, and Positive Politics' (number 43). No wonder economists had little truck with Isis!

Other entries in the critical bibliography that are worth noting are works by William Ashley (1928), Florian Cajori (1929) (Cajori was a regular contributor to the journal, mostly on the history of mathematics), and Alexander Gray (1932). The founding of Econometrica is given a detailed entry in volume 20 (1933–34). In 1953, the year after Cohen took over from Sarton, Joseph Schumpeter's Essays (Clemence 1951) are listed in the critical bibliography, but it is the only entry in an otherwise veritable desert for economics. This may be partly due to Henry Guerlac's (1953) suggestions for a new classification scheme for the bibliography. Oddly, Schumpeter's major tome of 1954 did not make it into the journal, either as a book review or as an entry in the critical bibliography, even though it makes an exemplary effort to address developments in the history of science and intellectual history more generally. In 1955, the broader category was renamed the "Sciences of Man (psychology, cultural anthropology, sociology)," and "Economics" bit the dust as far as *Isis* was concerned. There are only a few entries on economics over the next two decades, hardly representative of the extant scholarship. Yet this transpired precisely when the critical bibliography was much expanded by its new editor, Harry Woolf, who devoted some ninety pages to it. John Neu of the University of Wisconsin was thereafter brought in as the editor of the critical bibliography (he is a trained librarian, not a scholar in the history of science), and things stayed much the same until 1979, when HOPE became part of its database. Only in 1988 was "Economics" once again listed as a distinct subheading in the table of contents for the bibliography.

The histories of psychology and of anthropology most certainly fared better treatment throughout these years, partly, I believe, because they did not have as developed an alternative as the history of economics and partly because, as I noted in my "Breaking Away" (Schabas 1992), there were more obvious points of entry via the history of medicine and biology. It took time before more than a handful of historians of economics fully grasped the depth of intersection between economics and the other sciences, both natural and social. The books by Vernard Foley (1976) and Claude Ménard (1978) are notable exceptions. There were, however, several efforts at cross-fertilization by historians of science, namely, William Coleman (1982), Martin Rudwick (1974), S. S. Schweber (1977), and Robert Young (1985). Scott Gordon's (1973) entry in a well-known collection also served to make economics part of the status quo, as did his appointment in 1985 to the History and Philosophy of Science Department at Indiana University.

The first full-fledged article in *Isis* that counts unambiguously as the history of economics is Joseph J. Spengler's "On the Progress of Quantification in Economics" (1961). Others that could qualify are the 1957 article by Conway Zirkle and the 1958 article by none other than John Maynard Keynes. To this list could also be added Howard Gruber's (1961) and Stillman Drake's (1967).

Another indication that economics had a toehold in the history of science world in its formative stage can be seen in the work of Theodor Merz and John Desmond Bernal. Merz issued a monumental four-volume History of European Thought in the Nineteenth Century (1904–12), in which economics received a very respectable treatment. In the opening preface to volume 1, Adam Smith, François Quesnay, and the physiocrats are briefly mentioned, and they are given a more lengthy examination in volume 4 along with the classical economists of the nineteenth century (429, 452-59, 540-44). While Merz's work was not exclusively on the history of science, it has long remained compulsory reading for historians of science. So it is fair to say that most historians of science have had some brush with the field.

J. D. Bernal's sweeping *Science in History* (1954) assigned volume 4 to the social sciences, with lengthy accounts on the history of economics. As a pronounced Marxist, this might have seemed like an obvious step to Bernal. It might also explain why, as Mirowski (1992a) noted in his comments to my 1992 *HOPE* piece, mainstream historians of science steered clear of economics during the height of the Cold War. The *Isis* eclipse of economics as a reference heading in its critical bibliography ran almost exactly in step with the war, from 1955 to 1988. A set of "Critiques and Contention" on "Marxism and the History of Science," based on lectures given at the Bucharest meeting of the International Congress of the History of Science (1981), were not jingoistic but, in the case of R. S. Westfall (1981, 402–5), were nevertheless firmly against Marxist accounts.

There are two distinct but clearly related ways in which the history of economics and the history of science can merge. One is institutional, the other is intellectual. I have all along been more interested in the latter issue, though many of my critics took me to task on the former. The reason the first is of lesser importance to me is that the history of science, while clearly established in the university curriculum, is not housed in any typical pattern. As several critics pointed out, for all of the separate departments at major universities (and some, such as Yale and Michigan, lack even that), there are numerous other practitioners housed in departments of history, philosophy, and even, occasionally, science, although this is the least likely configuration. So it seems foolhardy to offer prescriptions given all of the institutional idiosyncrasies. Ideally, every university of some size would have a history of science or science studies department, and there would be at least one historian of economics. But that is not a world we are likely to see anytime soon, if ever. I suggest, for the near future, we set more modest goals.

One proposal is to begin cross-listing history of economics courses with history of science, history, or philosophy courses. I tested this for two semesters at the University of Wisconsin at Madison, where I taught the course cross-listed with my department of the history of science. This attracted a number of students from both groups, including graduate students in the history of science. I will do something similar at my new post at the University of British Columbia, where the course will be given as the "History and Philosophy of Economics," cross-listed with economics and philosophy. Some of my critics, notably Samuel Hollander (1992) and Donald Walker (1992), expressed worries that economics

majors would cease to take history of economic thought were it housed elsewhere. If the course carried humanities credit, however, it might well find an increased enrollment by economics majors in search of a kindred subject that would fill distributional requirements.

The potential for greater intellectual mergers is unbounded, particularly as we move away from the history of separate disciplines and embrace cultural history more fully. We see this already in the cited works of Porter, Schaffer, Pamela Smith, and Wise, to name only a few historians of science. Analogously, several prominent historians of economics, for example, Neil De Marchi, Judy Klein, Robert Leonard, Philip Mirowski, Mary Morgan, Esther-Mirjam Sent, and Roy Weintraub, are weaving economic strands into a cloth that would more properly be recognized as cultural history.

The other point on which I was misunderstood was our intended audience. I believe that the history and philosophy of science is read and appreciated by practitioners in the natural sciences, and this has been more the case in recent decades as the field matures (I view the Sokal affair as an aberration). The American Association for the Advancement of Science (AAAS), for example, normally has a distinguished historian of science give an address at its annual meetings. Indeed, the first meeting of the History of Science Society (in 1924) was with the AAAS, and for many years thereafter the society met in alternate years with the scientists. The magazine American Scientist, which is aimed at readers with at least one degree in the sciences, usually features some historical articles. It is my belief, though this can only remain a conjecture, that we historians of economics would actually garner more respect from the economics profession if we distanced ourselves from mainstream economists and acquired a more independent voice. As George Basalla (1975) observed, the history of the natural sciences accomplished this circa 1970–75.7 Maturation is always about autonomy. My depiction (Schabas 1992) of the typical historian of economics as a prodigal son was fully intended. We need to become more independent and selfconfident in order to speak more forcefully to, and be better heard by,

<sup>6.</sup> Alan Sokal, a physicist, published an article in Social Text that was intended to expose the superficial rhetoric of postmodern studies of science. It was a hoax that sparked the so-called science wars between mainstream scientists and those in science studies (history, sociology, and philosophy of science).

<sup>7.</sup> Basalla (1975, 469) in a retrospective address implored historians of science to stop just writing for their own group and to make more ties with historians of technology (his area) and the educated public at large.

contemporary economists. They will become our most valuable recipients if and when we start to write the history of economics on its own terms.

Giovanni Caravale (1992) and Donald Walker (1992), in critiques of my "Breaking Away," suggest that history serve current analysis. This I think it can never do satisfactorily, as it would result in half-baked attempts to render Ricardo into the calculus. What purpose does this serve other than an intellectual exercise? One might as well play a game of chess. To understand Ricardo is to put him in a historical context, to link his ideas to the intellectual milieu in which he lived. The more the past economic ideas are treated in their own right, rather than as precursors to present theory, the better. The reason for this strikes me as obvious. We no longer believe in objective knowledge or a determinate history. All ideas are contingent, and hence no past idea necessitates a present one. To impose present concepts and terminology on the past is thus to distort the historical record. History is at best an indirect tool for understanding the present, in that it exposes us to alternative worlds and thus informs us about the diversity of the human condition. Economists might learn something by understanding the different approaches to their subject matter, rather than by simply mining past theories for what they consider significant verities. As Ted Porter (1992, 235) woefully pointed out, "history as legitimation is still very strong in history of economics." Nevertheless, there are signs that the balance has tipped in the other direction. Humility is difficult to earn, but the wisdom gleaned from the past strikes me as the preferable way to proceed.

## References

Alborn, Timothy. 1996. The Business of Induction: Industry and Genius in the Language of British Scientific Reform, 1820–1840. *History of Science* 34:91–121.

Ashley, William. 1928. *The Bread of Our Forefathers*. Vol. 11. Oxford: Oxford University Press.

Ashworth, William J. 1996. Memory, Efficiency, and Symbolic Analysis: Charles Babbage, John Herschel, and the Industrial Mind. *Isis* 87:629–53.

Basalla, George. 1975. Observations on the Present Status of History of Science in the United States. *Isis* 66:467–70.

Bernal, James Desmond. 1954. Science in History. 4 vols. New York: Cameron Associates.

Blaug, Mark. 1997. *Economic Theory in Retrospect*. 5th ed. New York: Cambridge University Press.

- Boulding, Kenneth. 1971. After Samuelson, Who Needs Adam Smith? HOPE 3:225-37.
- Brantlinger, Patrick, ed. 1989. Energy and Entropy: Science and Culture in Victorian Britain. Bloomington: Indiana University Press.
- Cajori, Florian. 1929. New Data on the Origin and Spread of the Dollar Mark. Scientific Monthly 22:212-16.
- Caravale, Giovanni, 1992, Comment, HOPE 24:204-7.
- Christensen, Paul. 1989. Hobbes and the Physiological Origins of Economic Science. HOPE 21:689-709.
- Clemence, R. V, ed. 1951. Essays: On Entrepreneurs, Innovations, Business Cycles, and the Evolution of Capitalism, by Joseph Schumpeter. Cambridge, Mass.: Addison-Wesley.
- Coats, A. W. 1969. Research Priorities in the History of Economics. HOPE 1:9-18.
- Cohen, I. Bernard, ed. 1994. The Natural Sciences and the Social Sciences. Dordrecht: Kluwer.
- Coleman, William. 1982. Death Is a Social Disease: Public Health and Political Economy in Early Industrial France. Madison: University of Wisconsin Press.
- Cremaschi, Sergio, and Marcelo Dascal. 1998. Malthus and Ricardo: Two Styles for Economic Theory. Science in Context 11:229-54.
- De Marchi, Neil, ed. 1993. Non-Natural Social Science: Reflecting on the Enterprise of "More Heat Than Light." Supplement to volume 25 of HOPE. Durham, N.C.: Duke University Press.
- De Marchi, Neil, and John Lodewijks. 1983. HOPE and the Journal Literature in the History of Economic Thought. HOPE 15:321-43.
- Dimand, Robert. 1993. The Case of Brownian Motion: The Contribution of Bachelier. British Journal for the History of Science. 26:233–34.
- Drake, Stillman. 1967. A Seventeenth-Century Malthusian. *Isis* 58:401–2.
- Ekelund Jr., Robert B., and Robert F. Hébert. 1999. Secret Origins of Modern Microeconomics: Dupuit and the Engineers. Chicago: University of Chicago Press.
- Emmett, Ross B. 1997. Reflections on "Breaking Away": Economics as Science and the History of Economics as History of Science. Research in the History of Economic Thought and Methodology 15: 221–36.
- Foley, Vernard. 1976. The Social Physics of Adam Smith. Lafayette, Ind.: Purdue University Press.
- Frängsmyr, Tore, ed. 1989. Science in Sweden: The Royal Swedish Academy of Science, 1739-1989. Canton, Mass.: Science History Publications.
- Frängsmyr, Tore, J. L. Heilbron, and Robin E. Rider, eds. 1990. The Quantifying Spirit in the Eighteenth Century. Berkeley.: University of California Press.
- Gillispie, Charles Coulston. 1951. Genesis and Geology. Cambridge: Harvard University Press.
- . 1957. The Natural History of Industry. *Isis* 48:398–407.
- . 1960. The Edge of Objectivity. Princeton, N.J.: Princeton University Press.

- . 1980. Science and Polity in France at the End of the Old Regime. Princeton, N.J.: Princeton University Press.
- , ed. 1970. Dictionary of Scientific Biography. 15 vols. New York: Scribner.
- Gordon, H. Scott. 1973. Alfred Marshall and the Development of Economics as a Science. In *Foundations of Scientific Method: The Nineteenth Century*, edited by R. N. Giere and R. S. Westfall. Bloomington: Indiana University Press.
- . 1989. Darwin and Political Economy: The Connection Reconsidered. *Journal of the History of Biology* 22:437–59.
- Grabiner, Judith V. 1998. Some Disputes of Consequence: Maclaurin among the Molasses Barrels. *Social Studies of Science* 28:139–68.
- Gray, Alexander. 1932. *The Development of Economic Doctrine*. Vol. 17. London: Longmans, Green.
- Gruber, Howard. 1961. Darwin and Das Kapital. Isis 52:582-83.
- Guala, Francesco. 2001. Building Economic Machines: The FCC Auctions. Studies in History and Philosophy of Science 32:453–77.
- Guerlac, Henry. 1953. A Proposed Revision of the *Isis* Critical Bibliography. *Isis* 44:226–28.
- Henderson, James P. 1996. Early Mathematical Economics: William Whewell and the British Case. Lanham, Md.: Rowman and Littlefield.
- Hetherington, Norriss S. 1993. Isaac Newton and Adam Smith: Intellectual Links between Natural Science and Economics. In *Action and Reaction*, edited by Paul Theerman and Adele F. Seeff. Newark, N.J.: University of Delaware Press.
- Hollander, Samuel. 1983. William Whewell and John Stuart Mill on the Methodology of Political Economy. Studies in the History and Philosophy of Science 14:127–68.
- ——. 1992. Comment. HOPE 24:212–14.
- Ingrao, Bruna. 1994. Physical Metaphors and Models in Pareto's Thought. *Archives internationale d'histoire des sciences* 44:63–91.
- Ingrao, Bruna, and Giorgio Israel. 1987. *La Mano Invisible*. Roma-Bari: Laterza and Figli Spa.
- Jackson, Myles. 1994. Natural and Artificial Budgets: Accounting for Goethe's Economy of Nature. Science in Context 7:409–31.
- Jorland, Gérard. 1996. Le rejet du programme de Condorcet à l'époque romantique. Sciences et techniques en perspective 35:31–38.
- . 2000. The Coming into Being and Passing Away of Value Theories in Economics (1776–1976). In *Biographies of Scientific Objects*, edited by Lorraine Daston. Chicago: University of Chicago Press.
- Kaye, Joel. 1997. Economy and Nature in the Fourteenth Century: Money, Market Exchange, and the Emergence of Scientific Thought. Cambridge: Cambridge University Press.
- Keynes, John Maynard. 1958. A Mathematical Analysis by Newton of a Problem in College Administration. *Isis* 49:174–76.

- Klein, Judy L. 1997. Statistical Visions in Time. Cambridge: Cambridge University
- Koerner, Lisbet. 1999. Linnaeus, Nature, and Nation. Cambridge: Harvard University Press.
- Koyré, Alexandre. 1965. Newtonian Studies. Chicago: University of Chicago Press.
- Krüger, Lorenz, Gerd Gigerenzer, and Mary S. Morgan, eds. 1987. The Probabilistic Revolution, Vol. 2. Cambridge: MIT Press.
- Kuhn, Thomas S. 1962. The Structure of Scientific Revolutions. Chicago: University of Chicago Press.
- . 1977. The History of Science. In *The Essential Tension*. Chicago: University of Chicago Press.
- Leonard, Robert J. 1998. Ethics and the Excluded Middle: Karl Menger and Social Science in Interwar Vienna. Isis 89:1-26.
- Lindqvist, Svante. 1990. Labs in the Woods: The Quantification of Technology during the Enlightenment. In Frängsmyr, Heilbron, and Rider 1990.
- Maas, Harro. 1999. Mechanical Rationality: Jevons and the Making of Economic Man. Studies in the History and Philosophy of Science 30:587–620.
- Mäki, Uskali. 1997. Universals and the Methodenstreit: An Examination of Carl Menger's Conception of Economics as an Exact Science. Studies in the History and Philosophy of Science 28:475-95.
- Ménard, Claude. 1978. La formation d'une rationalité économique: A. A. Cournot. Paris: Flammarion.
- Merz, Theodor. 1904–12. A History of European Thought in the Nineteenth Century. 4 vols. New York: Dover.
- Mirowski, Philip. 1989. More Heat Than Light. Cambridge: Cambridge University Press.
- ——. 1992a. Comment. *HOPE* 24:221–23.
- —. 1992b. Looking for Those Natural Numbers: Dimensionless Constants and the Idea of Natural Measurement. Science in Context 5:165-88.
- —, ed. 1994. Natural Images in Economic Thought. Cambridge: Cambridge University Press.
- -. 1999. Cyborg Agonists: Economics Meets Operations Research in Mid-Century. Social Studies of Science 29:685-718.
- Morgan, Mary S. 1997. The Technology of Analogical Model Building: Irving Fisher's Monetary Worlds. Philosophy of Science 64:304-14.
- Morgan, Mary S., and Margaret Morrison, eds. 1999. Models as Mediators: Perspectives on Natural and Social Sciences. Cambridge: Cambridge University Press.
- Morrell, Jack, and Arnold Thackray. 1981. Gentlemen of Science. Oxford: Clarendon Press.
- Mosselmans, Bert. 1998. William Stanley Jevons and the Extent of Meaning in Logic and Economics. History and Philosophy of Logic 19:83-99.
- Multhauf, Robert P. 1975. Reflections on Half a Century of the History of Science. Isis 66:454-67.

- Poirier, Jean-Pierre. 1993. Lavoisier: Chemist, Biologist, Economist. Translated by Rebecca Balinski. Philadelphia: University of Pennsylvania Press.
- Porter, Theodore. 1986. The Rise of Statistical Thinking, 1820–1900. Princeton, N.J.: Princeton University Press.
- 1992. Comment. HOPE 24:234–36.
- . 1995. Trust in Numbers. Princeton, N.J.: Princeton University Press.
- Power, Michael, ed. 1996, Accounting and Science: Natural Inquiry and Commercial Reason. New York: Cambridge University Press.
- Rashid, Salim. 1981. Political Economy and Geology in the Early Nineteenth Century: Similarities and Contrasts. HOPE 13:726-44.
- Redman, Deborah A. 1997. The Rise of Political Economy as a Science. Cambridge: MIT Press.
- Riskin, Jessica. 1998. Poor Richard's Leyden Jar: Electricity and Economy in Franklinist France. Historical Studies in the Physical and Biological Sciences 28:301-36.
- Romano, Richard M. 1982. The Economic Ideas of Charles Babbage. HOPE 14:385-405.
- Rudwick, Martin. 1974. Poulett Scrope on the Volcanoes of Auvergne: Lyellian Time and Political Economy. British Journal for the History of Science 7:205-42.
- Rusnock, Andrea. 1999. Biopolitics: Political Arithmetic in the Enlightenment. In The Sciences in Enlightened Europe, edited by William Clark, Jan Golinski, and Simon Schaffer. Chicago: University of Chicago Press.
- Sarton, George. 1921. Herbert Spencer. Isis 3:375-90.
- ——. 1923. Knowledge and Charity. *Isis* 5:5–19.
- . 1935. Lusitanian Memories. Isis 22:440–55.
- Schabas, Margaret. 1989. Alfred Marshall, W. Stanley Jevons, and the Mathematization of Economics. Isis 80:60-73.
- . 1990. A World Ruled by Number. Princeton, N.J.: Princeton University Press.
- . 1992. Breaking Away: History of Economics as History of Science. HOPE 24:187-203.
- -. 1997. Victorian Economics and the Science of the Mind. In Victorian Science in Context, edited by Bernard Lightman. Chicago: University of Chicago Press.
- Schaffer, Simon. 1989. Defoe's Natural Philosophy and the Worlds of Credit. In Nature Transfigured: Science and Literature, 1700-1900, edited by John R. R. Christie and Sally Shuttleworth. Manchester: Manchester University Press.
- -. 1994. Babbage's Intelligence: Calculating Engines and the Factory System. Critical Inquiry 20:203-27.
- Schumpeter, Joseph A. 1954. History of Economic Analysis. New York: Oxford University Press.
- Schweber, S. S. 1977. Darwin and the Political Economists: Divergence of Character. Journal of the History of Biology 10:195–289.

- Sent, Esther-Mirjam. 2001. Sent Simulating Simon Simulating Scientists. Studies in the History and Philosophy of Science 32:479-500.
- Smith, Adam. 1980. Essays on Philosophical Subjects, edited by W. P. D. Wightman and J. C. Bryce. Oxford: Oxford University Press.
- Smith, Pamela. 1994. The Business of Alchemy. Princeton, N.J.: Princeton University Press.
- Spary, Emma. 1996. Political, Natural, and Bodily Economies. In Cultures of Natural History, edited by N. Jardine, J. A. Secord, and E. C. Spary. Cambridge: Cambridge University Press.
- Spengler, Joseph J. 1961. On the Progress of Quantification in Economics. Isis 52:258-76.
- Spiegel, Henry. 1991. The Growth of Economic Thought. 3d ed. Durham, N.C.: Duke University Press.
- Sumner, James. 2001. John Richardson, Saccharometry, and the Pounds-Per-Barrel Extract: The Construction of Quantity. British Journal for the History of Science 34:255-73.
- Tomaselli, Sylvana. 1995. Political Economy: The Desire and Needs of Present and Future Generations. In *Inventing Human Science*, edited by Christopher Fox, Roy Porter, and Robert Wokler. Berkeley, Calif.: University of California Press.
- Walker, Donald. 1992. Comment. HOPE 24:243-45.
- Westfall, Richard S. 1981. Reflections on Ravetz's Essay: Bernal's Marxist Vision of History. Isis 72:402-5.
- Wise, M. Norton. 1989-90. Work and Waste: Political Economy and Natural Philosophy in Nineteenth-Century Britain. History of Science 27:263-301, 391-449; 28:221-61.
- 1993. Mediations: Enlightenment Balancing Acts, or the Technologies of Rationalism. In World Changes: Thomas Kuhn and the Nature of Science, edited by Paul Horwich. Cambridge: MIT Press.
- -, ed. 1995. The Values of Precision. Princeton, N.J.: Princeton University Press.
- Yonay, Yuval P. 1994. When Black Boxes Clash: Competing Ideas of What Science Is in Economics. Social Studies of Science 24:39-80.
- Young, Robert. 1985. Darwin's Metaphor: Nature's Place in Victorian Culture. Cambridge: Cambridge University Press.
- Zirkle, Conway. 1957. Benjamin Franklin, Thomas Malthus, and the United States Census. Isis 48:58-62.