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The Moral Economy of Natural History and Medicine in the Dutch Golden Age

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From at least the 1940s, historians of science have used the term 'scientific revolution' to denote what is seen as a fundamental transformation of ideas about the natural world, occurring in Europe during the sixteenth and seventeenth centuries. In Herbert Butterfield's widely-used textbook, this revolution is said to outshine "everything since the rise of Christianity" (Butterfield 1960: 7). The phrase 'scientific revolution' has usually been taken to mean a change in basic philosophical concepts about the constitution of the universe, and is commonly associated with conceptual developments per se, especially in mathematics or what is now called 'physics.' The classic statement of this view is the work of Alexandre Koyré, an avowed Platonist, who maintained that science emerged from "the mathematization (geometrization) of nature" and from no other source but this shift in pure thought—it had nothing to do, he explicitly argued, with the *vita activa* (Koyré 1968: 6). The distinguished Dutch mathematician and historian of science, E.J. Dijksterhuis, had a slightly different view, stressing the 'mechanization' of the world picture (Dijksterhuis 1986). But Dijksterhuis, Koyré, and many others of their generation, agreed on two propositions: that science in a recognizably modern form arose in Europe in the sixteenth and seventeenth centuries, and that this transformation was a mental event, with intellectual causes. Since they set the agenda for the new academic discipline of the history of science that grew up after the war, their basic formulation of the idea of the scientific

revolution has remained the mainstream position right up until the present.¹

Theirs is an honorable tradition, and a useful concept. But the history of science, too, has felt the winds blowing from the sociologists, phenomenologists, literary critics, and anthropologists, among others. A general dissatisfaction has been brewing about how best to describe the early modern European view of nature, as well as about how to account for the changes that occurred. In the spirit of this new situation, in which ambiguity, uncertainty, and pluralism are replacing the master narratives, I would like to offer two suggestions, one descriptive, the other causal.

First, we need to recognize that the discovery of hosts upon hosts of new and detailed data about nature in all its variety played an important part in the intellectual drama of the day, perhaps even taking center stage, while physics and philosophy were merely a part of the scientific revolution rather than its essence; and second, a variety of cultural values helped to shape interest in the new investigations of nature, some of which were associated with new forms of commerce that were transforming European society generally. Both the new discoveries about nature and the new cultural values are very nicely exemplified by the tremendous interest in natural history and medicine in the Dutch Golden Age.

On the first point, I would like to draw attention to an aspect of the development of early modern views about nature that has been generally overlooked by historians of science for 40 years or more, although the subject has recently been gaining renewed attention (Eamon 1994; Findlen 1994). For while Galileo and Descartes debated the best ways to think about the structure of the world, the world itself was being discovered. This is not to say that early modern people saw the stars, beasts, or herbs for the first time. But they did try to take account of natural things through recording detailed observations, and by trying to sort out fact from fiction according to standards of material existence. The development of investigations into the 'thingness' of nature, of trying to establish the facts of the world both in the heavens and beneath them—the facts in all their empirical detail, and to get even the minutia

¹ For a critical appraisal of the argument about the scientific revolution as a shift in metaphysical view, see Hatfield 1990.

correct—characterized an explosion of investigations. Indeed, if we look for what we might call the ‘big science’ of the period, we do not find it in the early modern equivalent of nuclear accelerators and departments and institutes of physics. A few physical instruments there were, such as quadrants for measuring the heavens, telescopes for observing the details of heavenly bodies, and the air pump—and most of these devices were hard to make or expensive to buy. But until the end of the seventeenth century, few universities possessed physical cabinets for teaching, much less for investigating (Cook 1992; Cook 1993).

No, if one is looking for where the money went, as well as a tremendous amount of human labor, talent, and excitement, one runs right into medicine and natural history. (I am here leaving aside the issue of technology, which deserves integration into the following account.) By the early seventeenth century no university with pretensions to international rank would be found without its anatomy theater, botanical garden, cabinet of curiosities, and chemical laboratory. Indeed, many municipalities with claims to world importance developed their own theaters, gardens, and collections. This discovery of the world—its geography, peoples, plants and animals, and alchemical associations; the accumulation of specimens of it, the cataloguing of its variety, and the detailing of its structure—created extraordinary public excitement. The voluminous travel literature; the beautiful books on anatomy, geography, botany and zoology; the rich storehouse of images, from still-lives to landscapes to pen-and-ink drawings of naturalia; the many stories of curiosities and marvels to be found in newspapers and journals; and the many new remedies being introduced for preserving health and treating disease: all mark the importance of the discovery of the world in its unexpected, rich variety. While today, given our preoccupation with theory, we sometimes look down our noses at the ‘fact-grubbers,’ people in the seventeenth century expressed a great deal of excitement about the detailing of “matters of fact,” as they were called (see esp. Dear 1985; Shapin and Schaffer 1986). We need to take this detailing of nature into account in our views of the scientific revolution.

When it came to establishing new and important matters of fact, the Dutch were among the leading investigators in Europe, with renowned names like Stevin, Sylvius, Tulp, Swammerdam, De Graaf, Leeuwenhoek, and

Boerhaave. But why? Other recent historians of science who have drawn attention to the general importance of the establishment of "matters of fact" for the scientific revolution, have taken the English, and sometimes the French and Italians, as models. Perhaps as a consequence, the patronage of princes and the growth of an independent gentry have been used to explain the special kinds of social values that established the credibility of new facts. It was the moral relationships among the gentry and/or aristocracy (it is said), especially their codes of conduct, that gave rise to guarantees for the truth of matters of fact and created the stimuli for new investigations (see esp. Biagioli 1993; Shapin 1994). But the Dutch were a notoriously unaristocratic society. Louis XIV sneered at the burgers who ran the Republic—a REPUBLIC, of all things. And yet new investigations into nature flourished in this commercial milieu, even without a Parisian Academy of Sciences or a Cimento, even without a Royal Society of London.

Given both the importance of Dutch investigators to the new science generally, and of commerce to life in the Dutch Republic, it is worthwhile considering some of the connections between social life and the new studies of natural things among the Dutch urban elite. In example after example, one notes the patronage and encouragement of the merchants and *regenten* of the Netherlands for the new science: people like the Amsterdam burgomasters Johannes Hudde or Coenraad van Beuningen, or a Nicholaas Witsen or the Commelins. That trade and learning supported one another had, indeed, become almost a commonplace in the northern Netherlands. One of the major intellectual figures of Amsterdam early in the seventeenth century, Caspar Barlaeus, set out to prove in his inaugural lecture at the Amsterdam athenaeum that "there exists a sound relationship between commerce and the study of literature and philosophy" (quoted in Regin 1976: 80). Aristotle himself, of course, had noted that one of the prerequisites for philosophy was leisure, and the wealth of the Golden Age clearly helped to support a growing number of people with time enough to pursue natural investigations with care. Some historians have also stressed the importance of money in paying for the books and apparatus necessary for much early modern science.

But Barlaeus suggested something more than a correlation between learning and wealth: he suggested something that might today be called the

'moral economy' of commerce.² There are many ways in which the values of those engaged in trade could affect their views about the proper ways to investigate nature. But among those ways, three stand out as essential for contemporary Dutch capitalism as well as for natural knowledge: the accumulation of things, the emphasis on knowledge as the accumulation of information, and the importance of plain-speaking as evidence of credit-worthiness.

The first of these three relationships is perhaps the most obvious: one only has to conjure up a mental image of the new and large buildings near the docks of the late 16th and the 17th centuries. Contemporary Dutch capitalism filled the port-side warehouses to bursting with goods imported from all over the world. I do not wish to minimize the vicious methods by which labor was mobilized and exploited in the colonies of the East Indies, Africa, or the Americas in order to produce the items that Europeans desired. But in the Dutch Republic itself, the growth of capital depended as much on methods of accumulating goods as of producing them. For a new kind of capitalism was coming into being: not an economy of markets, but a market economy. For example, one recent article notes that one of the most important risks of business in the period was short term volatility in the commodity supply. "Under these circumstances, investing in inventory [was] crucial to a smooth functioning of the market ..." (Klein and Veluwenkamp 1993: 28). The permanent staple market that developed in places like Amsterdam and Rotterdam served to concentrate supply and demand, which "reduced the commercial risk, so that the cost price decreased. As supply was less regular than sales, prices fluctuated. These price fluctuations offered the prospect of future profits and thus stimulated stockpiling. Stockpiling, in turn, had a stabilizing effect on the price" (31-32). Holland consequently became "a

² I am using the term in the way Thompson (1971) originally introduced it, as a circulation of moral values within communities, values about "social norms and obligations, of the proper economic functions of several parties within the community" (79). For a more recent, if anti-materialist, view of the 'moral economy,' see Daston, forthcoming. Pamela Smith (1994a and 1994b) has recently stressed the connection between early modern science and money-making, which is an important theme, but which is left aside in this article.

central storehouse and exchange" for the world market (33). "And inventory investment was—as already indicated—at the very heart of the Dutch entrepôt trade, which in turn was the focal point of the commercial expansion of the Dutch economy" (49).³

Among the items brought back to the Dutch entrepôt from all over the world were rarities and curiosities of all sorts. These things at first tended to be one-of-a-kind, or at least scarce, objects, brought back in the bags of seamen or the chests of officers and merchants, sometimes at random but sometimes on order. Of course, many of these objects came to rest in the curiosity cabinets possessed by burghers, physicians, *regenten*, and nobles. Other specimens were cultivated in botanical gardens, especially as professional gardeners began to develop new techniques for wintering over plants from the tropics using furnaces and glass. Over time, a steady trade in naturalia developed, with a few brokers even buying up objects at dockside and later selling them to collectors.⁴ In short, many people began to collect various kinds of objects from nature, even specializing in particular things and trying to collect as many examples as possible: shells, tulips, pressed leaves and flowers, and so forth. The collectors of naturalia kept detailed inventories of what they had, tried to find new specimens to fill out their collections, and bought books describing the collections of others as a way of substituting for what they could not acquire directly. The accumulation and warehousing of material objects was part of the creation of value for both naturalists and merchants.

Second, traders accumulated not only objects, but information. They depended upon precise and detailed knowledge about the things in which they dealt, as well as about markets. Knowledge was a "durable possession," and like capital, was of fundamental importance to a business (Klein and Veluwenkamp 1993: 42). The accumulation not just of things but of

³ Also see Steensgaard (1974) esp. pp. 141-151; and Israel (1979).

⁴ A good example is that of the elder Swammerdam (whose Amsterdam apothecary shop lay across from the East Indies docks, giving him the opportunity to collect rarities from all over the world), and of the Commelins (who collected rare plants for the Amsterdam botanical garden).

information—accurate information—was essential to commerce. For the hard-headed merchant, the foundation of true knowledge lay not in debating general premises or conclusions but in accumulating precise and accurate information. Moreover, while some items of information might be kept secret, commerce required cooperation among traders in outfitting ships, gathering financial shares, and finding crews, and that cooperation could best be garnered by sharing information. In short, commercial traders valued empirical discovery, accurate and detailed reporting, and (up to a point, of course) public dissemination of information—just as did those whom we call the ‘scientists’ of the age.

Finally, relationships among those involved in commerce depended upon establishing the personal credibility of each person. At the root of the monetary economy lay ‘credit’ and ‘value’—words that properly apply to human relationships, some of which we call commercial. To quote Klein and Veluwenkamp again, from “trust came recommendations, guarantees and credit. Trust was perhaps even more important than capital, the main function of which indeed was—and is—to generate trust, and thereby credit. Money is trust; the equation is reversible” (Klein and Veluwenkamp 1993: 41). But the ways in which personal credibility was established in the world of merchants were not entirely the same as those in the world of royal courts.

Elsewhere, upper classes might speak clearly to their peers, but relations with their inferiors as well as the shadow-worlds of allusive court politics hardly made for the habit of speaking forthrightly. In the world of commercial credit, however, plain and unadorned speech came to be one mark of the truth-teller.⁵ And the straightforward accounts of merchants were among the models of creditworthiness, even for English gentleman like Robert Boyle. “[Y]ou will be invited to look on this account,” Boyle wrote in one case, “as very sincere, and on that score Credible,” not because it was written by a philosopher, but because it was written “by a Merchant or Factor for his Superiors, to give them an account of a matter of fact” (quoted in Dear 1985: 156).

The moral economy of commerce does not explain everything about the

⁵ Since the 1930s, at least, the connection between simple language and science has been noted, although it has usually been attributed to ‘Puritanism;’ see, for example, Jones (1961).

scientific revolution, of course. Indeed, one can easily strain analogies too far: while merchants tended to accumulate goods in bulk, naturalists tended to treasure unique specimens; competition for trade sometimes meant the withholding of information as well as the sharing of it; and plain speaking sometimes indicated a boor more than a person capable of understanding subtlety and nuance. A fuller account of the development of the new science in the Netherlands would detail the humanist heritage of the Low Countries, the system of schooling, religious toleration and sectarianism, and the culture of moral edification that also deeply affected Dutch intellectual developments. But the accumulation and detailed cataloguing of things; the tendency to value precise, empirical information and to equate that with knowledge; and the creditworthiness of plain speech, were all matters valued by those engaged in commerce. So, too, they were central to the investigations into nature during the time. This helps to explain not only why the new natural knowledge was pursued in the Dutch Republic—that most unaristocratic of early modern places—it helps to explain why it flourished. For the astute Barlaeus, there could indeed be a sound relationship between commerce and learning.

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