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Review

Reviewed Work(s): The Rise of Early Modern Science: Islam, China, and the West. by Toby E. Huff

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detailed analysis of agrarian themes and imagery, *The Manor, the Plowman, and the Shepherd* covers so much material so quickly that there is at least the appearance of superficiality in its sincere and enthusiastic arguments about the literature.

The first brief chapter, entitled "The Old World: Change and Crisis," focuses upon the poetry of the late thirteenth and early fourteenth centuries, particularly "Song against the Scholastic Studies," "The Venality of the Judges," "The Man in the Moon," "The Song of the Husbandman," *A Satire of Edward II's England*, and *Wynnere and Wastoure*.

The second chapter, "The Manor, the Plowman, and the Shepherd," deals specifically with agrarian imagery in *Piers Plowman*. In this poem, Hill argues, one finds an example of the "diminishing" historical importance of the plowman, who "himself assumes several roles before the end [of the poem] when, shorn of all agrarian imagery, he at last remains as an ideal to be sought." The shepherd, on the other hand, "is embodied in Will, who seems to represent the negative aspects of the Christian life until, at last, he sheds the imagery on Easter morning."

"New Values in a Changing World," the third chapter, attempts to treat Gower, Chaucer, and the poetry of what the author calls the "*Piers Plowman* legacy" in only thirty-six pages. The result is a series of observations concerning agrarian themes rather than interpretations of those images. There is, however, an interesting reading of Chaucer's use of the *Georgics* in *The Canterbury Tales*.

The book's fourth chapter, "The New World," analyzes such fifteenth-century texts with agrarian themes as "London Lickpenny," "Money, Money," "God Spede the Plow," "How the Plowman Learned His Paternoster," "The Tournament of Tottenham," four mystery plays—the Wakefield *Slaying of Abel*, the Chester *Adoration Play*, the two Wakefield shepherds' plays—and the morality play *Mankind*, while the fifth chapter, "The Pastoral Prevails," deals with husbandry literature, country-house poems, sermon literature, traditions of manuscript illumination, and the poetry of Skelton.

The book's final chapter, "Elizabeth's Pastoral Poets," attends to the agrarian imagery of Spenser, Sidney, and Shakespeare. Again, although the purpose of this study is to present the larger development of a theme and therefore does not require the depth of a more focused monograph, the analysis Hill provides is superficial at best.

Compounding these difficulties is the work's relative inattention to more recent scholarship. Of the nearly 250 secondary sources listed in the bibliography, only some 21 were published after 1982.

In spite of its overly general arguments *The Manor, the Plowman, and the Shepherd* provides a provocative introduction to a rich and interesting field of study.

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TOBY E. HUFF, *The Rise of Early Modern Science: Islam, China, and the West*. Cambridge, Eng.: Cambridge University Press, 1993. Pp. xiv, 409; 12 black-and-white figures. \$54.95.

Huff's aim in this book is to bring a sociologist's perspective to bear on the old question: why did modern science emerge in the West rather than somewhere else—say, Islam or China? Huff wants to know what prevented Muslims, who were at one time scientifically far ahead of Europeans, and the Chinese, who possessed a significant technological advantage over the West, from taking the next step and "breaking through" to modern science. Lurking behind this question is an old and dubious conception of science. In Huff's view, science is a collection of timeless truths, objectively discovered by the application of reason to empirical data; there is no such thing as European or Western science but (quoting Joseph Needham) only "universally valid world science, that is to

say, 'modern' science" (p. 60). In short, we do not create science; we discover it. True science is, in the final analysis, independent of culture.

Now, given my discontent with Huff's formulation of the problem, it is predictable that I will not be happy with his solution to it. But while pursuing his primary quarry, Huff in fact captures another. Implicit throughout the book are related, but far more modest, questions: in what ways did Islam and China differ from Christendom, and what significance did those differences have for the course of science in the three civilizations? Huff's implicit answers to these implicit questions, developed with considerable subtlety and erudition, are insightful, provocative, and well worth our attention.

Huff brings to bear on the problem the sociological achievements of Robert K. Merton, Benjamin Nelson, Joseph Ben-David, and Thomas Kuhn. In his exploration of medieval and early-modern scientific developments, he pays attention to the ethos of science, communities of scientific practitioners, and especially social institutions for the protection and cultivation of scientific activity. The argument goes something like this. Modern science is the product of disinterested inquiry, organized skepticism, free interchange, and the appeal to universal, rational criteria. In order for modern science to emerge in any culture, that culture must possess institutions ("neutral spaces") where those values can flourish: "If the scientific worldview is to prevail, its elements of universalism, communalism, organized skepticism, and disinterestedness must be given paradigmatic expression in the dominant directive structures of a society" (p. 213).

Now according to Huff, the required institutions or directive structures came to exist in medieval Europe, but not in China or medieval Islam. The critical differences, Huff believes, were in the realm of law, and he therefore undertakes an ambitious exploration of legal developments in Islam, China, and the West. His argument, in a nutshell, is that medieval Europe saw the emergence of the idea of corporate identity and the related ideas of jurisdictional limits and separation of powers. This "legal revolution" allowed the development of autonomous institutions, where innovation was protected and the various orthodoxies of European culture and its ruling elites could be freely questioned. Chief among such institutions were the universities, where scientific studies could be pursued without interference. By contrast, legal thought and practice in contemporary China and Islam remained personalistic, without any notion of corporate legal personality, jurisdiction, or separation of powers. As a result, neither civilization was able to develop institutions comparable to the European universities, where rationality and free inquiry could flourish. In Islam, scientific learning (once of a very high order) could not be sustained; in China, it never emerged.

I am no expert on medieval legal history, and I must therefore be cautious in assessing Huff's analysis of medieval legal developments. But what is clear is that he has read widely and intelligently in the enormous secondary literature on this subject and from those materials has constructed a provocative and suggestive argument. I am considerably less impressed when Huff ventures onto my home turf, elaborating on the place of science in the universities of medieval Europe and attempting to demonstrate that this activity represented the real beginnings of modern science.

The root of the problem is that Huff has no firsthand knowledge of the primary sources; his case rests entirely on secondary literature, which he approaches as an intelligent outsider. Lacking insiders' knowledge, he has no way of knowing which of the conclusions that he picks out of this secondary literature are contested and which sufficiently established by scholarly consensus to offer a solid foundation for the arguments he proposes to build on them. Thus, for example, he repeatedly appeals to extreme claims about the rationalism and naturalism of the twelfth century and about the extent to which the natural sciences figured in the curriculum of the European universities (pp. 106, 186–87, 230–31, *et passim*). Nobody would deny important developments in twelfth-century

thought or the significance of natural philosophy in the university curriculum, but few would accept Huff's extravagant formulation.

Most troubling of all is Huff's account of developments in astronomy and the emergence of heliocentrism—a test case for his thesis, to which he returns repeatedly (esp. pp. 341–59). Many of Huff's claims are objectionable. It is patent nonsense, for example, to maintain that (until Copernicus taught the world otherwise) it was considered illegitimate for mathematical astronomers to make claims about the physical reality of the heavens. And it is highly misleading to attribute to Galileo the opinion “that Scripture and Aristotle were now dead insofar as science was concerned” (p. 354). Most seriously, Huff is puzzled (his term) by the failure of medieval Islamic astronomers to become heliocentrists. They had the technical expertise required for such a step; and they worked out mathematical models identical, in some respects, with the models subsequently employed by Copernicus. Why, then, did they decline to go this “‘last mile’ to the modern scientific revolution” (pp. 59–60)?

It appears to me that Huff's puzzlement reflects his flawed conception of science and scientific progress. If heliocentrism is true (as we know it is), then the evidence that will demonstrate its truth must exist in nature, in a form available to the well-prepared seeker after truth. If Islamic astronomers, who obviously had the required preparation, failed to become heliocentrists, the reason must be the existence of some extrascientific obstacle. And, of course, Huff has one ready at hand: becoming heliocentrists “would have . . . forced an intellectual break with traditional Islamic cosmology as understood by the religious scholars” (pp. 59–60), and the astronomers did not have the institutional protection and encouragement that would have enabled them to take such a step. But in fact (as Huff himself admits on page 352) definitive evidence in favor of heliocentrism was nonexistent even at the beginning of the seventeenth century, let alone in medieval Islam. Why, then, need we appeal to cultural or institutional obstacles to explain the steadfast geocentrism of Islamic astronomers?

Finally, it is important to make clear that my skepticism about Huff's success in reaching his stated goal—explaining why modern science was a European discovery—and about a number of his historical arguments does not discredit and should not be allowed to obscure his considerable achievement: the persuasive appeal to social and institutional factors to explain the differential fates of early science in Islam, China, and European Christendom. Huff's project is an extraordinarily ambitious one; and although his book is certainly not the final word, it should serve as a stimulus to further discussion and research.

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HUGH OF FOUILLOY, *The Medieval Book of Birds: Hugh of Fouilloys' "Aviaryum,"* ed. and trans. Willene B. Clark. (Medieval and Renaissance Texts and Studies, 80.) Binghamton, N.Y.: Medieval and Renaissance Texts and Studies, State University of New York, 1992. Pp. xix, 343; black-and-white frontispiece, 109 black-and-white plates. \$30.

Since their genesis on the fifth day of Creation, winged creatures have exerted a special hold on the imagination. Unerring instincts, power of flight, physical beauty, and worldwide distribution have made this species a favorite vehicle for moralization from Noah's dove to Big Bird.

The publication under review provides unprecedented access to a Christologically moralizing tract composed in Picardy about 1140 for teaching purposes. The variously titled sixty-chapter text, termed *Aviary* by editor-translator Willene Clark, was completed by Hugh of Fouilloys (Hugo de Folieto) during his tenure as founding prior of St.-Nicholas-