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The focus of this volume—science, technology and medicine in the Middle Ages—reflects a discipline that is barely a century old. For in late autumn 1903, when the French physicist and philosopher of science Pierre Duhem began his investigations of the development of statics, he very much embraced the popular wisdom of the day, that there had been no science until the Renaissance. By the time he published the first volume of *Les origines de la statique* (Paris: A. Hermann 1905–1906), Duhem had encountered the work of Jordanus Nemorarius, whose writings he took to anticipate the work of Leonardo da Vinci (the subject of another of Duhem’s historical investigations [1906–1913]). The subtitle of the Leonardo volume—ceux qu’ il a lus et ceux qui l’ ont lu—underscores the dramatic shift that Duhem continued to pursue until his death in 1916: that early modern science did not arise *ex nihilo*, but instead was the product of a long history that stretched back into the Middle Ages.

In the intervening century since the publication of *Les origines*, Duhem has been rightly criticized for many of his historical and methodological constructions, but one that underlies many of them was his belief in the strong similarity if not virtual identity of the scientific enterprise in the Middle Ages and the early modern world. When he read Buridan’s accounts of impetus, he could see classical theories of inertial motion; when he found formulations of the mean-speed theorem, he observed its later role when \( v = at \); and when he read fourteenthcentury hypothetical discussions of diurnal terrestrial motions, he could see their consequences in the Copernican debate.

While Duhem’s investigations were largely confined to the physical sciences—after being offered a Parisian chair in history of science late in life, he declined it because he considered himself primarily a physicist—the same early historiographical inclinations *mutatis mutandis* may be seen in the other two areas explored by this volume. In particular, scholars of Duhem’s generation often used terms “science,” “technology,” and “medicine” in a sense that implied, if not explicitly stated, the congruence of those terms with their modern counterparts. Medicine poses its own particular problems in this respect. This is because medicine itself is both science and technology—a system of ideas, but also a system of practices spread across a wide range of social actors. But scholarship in medieval medicine also has a complex history, one profoundly shaped by the modern medical profession and its sense of corporate confidence, based on the identity of medicine and science. The pioneering scholarship on medieval medicine in the nineteenth and early twentieth centuries was largely carried out by physicians themselves, often working within institutes of medical history embedded in university medical faculties. In consequence, medical history was accused by professional historians, sometimes unfairly, of being antiquarianism, or worse, Whig history. In the case of medieval medicine, the general prejudices against the Middle Ages seemed to encourage the tendency of this style of
history towards self-congratulatory presentism. Most importantly, the older medical history was exclusively the story of doctors, or of institutions now controlled by doctors, such as hospitals. Non-physicians who worked on medieval themes gravitated towards editions of medical texts (particularly vernacular texts, and often edited by scholars of medieval literature).

Since the 1960s, non-physician historians trained in the methods of social history have surged into the field of medical history, bringing in their train new themes: the social and political context of disease and health care, the patient’s experience, the history of the body, and the role of non-professional providers, to cite only a few examples. Medieval medical history, at first rather slow to take up this trend, has over the last two decades begun to reap the social history dividend in the form of new approaches to public health in the medieval city, to illness and the care of the ill in the context of Christian religious values, to the historic impact of epidemic disease, and to the functioning of a pluralistic “medical marketplace.” Particularly in Europe, the venerable enterprise of text edition has begun to broaden out into the largely uncharted Latin medical material. More attention is being paid to the early medieval period, to the relationship of Islamic and European medicine, and to the development of medicine as a learned discipline within the nascent university. In sum, historians of medieval medicine, physicians as well as non-physicians, now have a clearer goal in view: understanding medieval medical knowledge as a coherent system of ideas about the body, its disorders, and the potential for intervention; and understanding how this knowledge did or did not affect actual practices, both on the level of individual care, and on the level of social or political arrangements.

The intellectual continuity between Islamic science and that of Latin Europe is an additional recurrent theme in this volume. This complex phenomenon was in great part owing to a common Greek heritage, which encompassed virtually the entire corpus of classical Greek science and philosophy that was extant when the Abbasid caliphs undertook to guide its translation into Arabic in the eighth century. Medieval Islamic science also had a strong Indian component, moreover, both astronomical (a tradition of celestial tables) and mathematical (Indian numerals and the place-value system). Elements of Greek science had reached India prior to Islam and were subsequently fed back, transformed, to the West. The translation movements of medieval times—Greek into Arabic, then Arabic into Latin, Hebrew and the European vernacular languages—bound the Islamic and European intellectual worlds into a coherent whole, disparity of ideologies notwithstanding. Finally, the great East-to-West diffusion of technology (but not science) from China to Europe ran parallel to and, to an extent, interacted with, the flow of science. Thus did Indian calculation and Indian agriculture follow the same routes of diffusion from East to West, fellow travelers in a vast movement of cultural change.

Medieval technology is today still a field that Lynn White, Jr. defined. In *Medieval Technology and Social Change* (1962), he not only touched the principal bases—agriculture, water power, military technology—but did so in a systemic way. His was not a “nuts and bolts” approach, but rather one that embedded technology in specific cultural and social systems. His construal of the agricultural revolution of the early
Middle Ages, based on the substitution of horse power for that of humans, still undergirds much of recent work on agricultural history, although subsequent scholarship shows that the various innovations (the padded horse-collar, horse shoes, the heavy plow, and three-course rotations including oats) were not as synchronic as he would have liked and displayed many local variations. Like Joseph Needham, he sketches out the great east-to-west movement of diffusion, although both the stirrup and the horse-collar reached Western Europe not through the Arab world from China (as in the cases of paper and gunpowder) but from Central Asia via the chain of nomadic peoples. He recognized the crucial role of water power in medieval industry and the necessary linkage of the waterpowered grist mill with the expansion of wheat cultivation. Because standard medieval documentation tends to be sparse in technical detail, White pioneered methodical expansion into iconography, philology, and archeology in particular, providing visual or semantic representations of some artifacts, or physical traces of the artifacts themselves, respectively.

The entries in this volume range in length from 500 to 3,000 words. We have created a small group of entries that can serve as launching points for the more specific entries in this volume: “Medicine, practical,” “Medicine, theoretical,” “Religion and science,” “Scientia,” “Technological diffusion,” and “Women in science” all discuss issues that have strong affinities to the modern world, but the central theme of these entries is cautionary, including indications of ways in which medicine, religion, science, technology, and gender issues had distinct understandings and implications in the medieval world.

Aside from these platform entries, we have selected topics that generally fall within one of six categories: Apparatus, Equipment, Implements, Techniques; Biography; Disciplines; Geographical Places; Institutions; and Scientific Genres, Theories, Texts, Traditions. To the extent that it is possible, authors have cast their nets widely to explore political, social, religious, or broader intellectual traditions and influences. In addition, many of the authors have discussed their topics with an eye to the historiographical tradition, and the references at the end of each entry have been chosen in many cases to provide additional sources of the primary, secondary and historiographical material relevant to the topic. Illustrations and maps have been chosen by authors to reflect significant examples of issues discussed in the entry text. A particularly useful feature of the entries is the cross-referencing system: within the entry text, the reader is alerted to corresponding entries by an asterisk placed before the associated entry name; at the end of each entry, a short list of related entries directs the reader to material that expands upon issues discussed in the entry; and the index at the end of the volume provides a third means of mining the text for relevant information.

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Abu Ma‘shar
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