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Kemp neatly calls, the “fantasia”, expressed by the painting of the *Last Supper* in which the perspectival illusion is interestingly explained. In the scientific field, similarly inspired ingenuity is found in Leonardo’s geometrical transformations.

The physiological truth so beautifully symbolized in the *Leda and the Swan* and the portrait of a *Lady on a Balcony* (the *Mona Lisa*) is here interpreted as “the procreative powers of all living things”. This exemplifies the author’s insight into the richness of Leonardo’s mind.

This book is full of insights which enrich the artistic interpretations offered; a feature which will make it exceptionally welcome to art historians. For historians of science it provides glimpses of the way from rigid mathematical exactitude into spatial transformations of the truth. This has been largely lost since algebra subjugated geometry as the chosen language of science. But spatial analysis was Leonardo’s great and unique contribution to the unification of art and science. His every painting and drawing is charged with his science in the form of his physics of light and shade, perspective, and the geometry of forces acting on all objects, be they rocks or men. Martin Kemp’s fluent expression of his awareness of this is to be warmly welcomed.

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MARY C. GILLETT, *The Army Medical Department 1775–1818*, Washington, D.C., Center of Military History (US Army), 1981, 8vo, pp. viii, 299, illus., \$11.00.

By the most diligent research, Dr. Mary C. Gillett has skilfully picked her way through a mass of conflicting historical material to select, with great perception and clarity, the significant events which provided the milestones in the evolution of the American Army medical system. It is an all-too-familiar story of ineffectual central control, makeshift organization, confused legislation, ill-defined responsibilities, and blurred chains of command. Personal, professional, and unit rivalries prevented the collaboration necessary for the provision of medical facilities and the transport of casualties and supplies during the ebb and flow of battle. This ranged over territory either frozen in snow and ice or scorched by burning heat, so that the book is as much a testament to the ragged, often starving soldiers, militiamen, and volunteers exposed to raging epidemics of smallpox, typhus, malaria, dysentery, and other diseases, as to the inadequately trained, equipped, and disciplined regimental surgeons, knee-deep in the blood and water of their trenches, or their hospital counterparts struggling with a massive influx of casualties in unsavoury and insanitary buildings.

Dr. Gillett’s limpid literary style makes for enjoyable reading and her opening chapter on contemporary medical practice provides a yardstick by which the performance of her American surgeons might be judged. She could, with profit, have provided similar synopses of each campaign to enable the reader the better to orientate himself amidst descriptions of the various engagements and to draw more meaningful conclusions. In fact, as the author explains, documentation was so poor that records are incomplete and overall statistics difficult to establish. Despite this handicap, Dr. Gillett has provided an admirable concluding chapter on inferences to be drawn. This all pointed to the need for strong central administration. Yet, in spite of the lessons of the Revolutionary War, the War of 1812 found the Army again unprepared, and it was not until 1818 that the Army Medical Department was finally established on a permanent basis.

Useful appendices, character sketches, full notes, a comprehensive bibliography, and maps, tables, and illustrations all augment an absorbing and well-documented review of early American medical history.

Surgeon Vice-Admiral Sir James Watt
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M. W. FLINN, *The European demographic system 1500–1820*, Brighton, Harvester Press, 1981, 8vo, pp. xi, 175, £15.95.

This book is one in a new series devoted to the history of pre-industrial Europe 1350–1850. Although not explicitly excluding the more traditional forms of historical writing and analysis, the list of titles leaves no doubt that the general editor, Geoffrey Parker, wishes to focus atten-

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tion upon more recently developed historical themes – poverty, crime, social control, economic and technical change, and demography. Professor Flinn's book is one of two in the first dozen titles to be given over to European population history. His aim is to describe the nature of the notable technical advances achieved in historical demography in recent years; to present the principal empirical findings yielded by the new methods; and to consider some of the complex problems of interpreting the new data. His review is bounded at one side by the paucity of data before the sixteenth century and at the other by the decay of the pre-industrial demographic "system". His final chapter, indeed, is entitled 'Breaking out of the system'.

In barely one hundred pages of text (the balance of the book consists of tables and a very valuable bibliography), Flinn is highly successful in his three-fold aim. He begins by describing the technique of family reconstitution which has produced such a rich harvest over the past quarter-century, and then outlines the forces which for centuries produced a broad, secular balance between fertility and mortality before turning to consider the variability of birth and death rates in the short term. Next follows a brief discussion of migration before a discussion in the last chapter of the gradual acceleration of growth rates in the later eighteenth century which led to huge rises in population throughout Europe, apart from France. Summary tables dealing with variables such as age at marriage, birth intervals, age-specific marital fertility rates, and infant mortality are scattered through the text, and there is a wealth of such data culled from many scores of reconstitution monographs in the appendix tables at the end of the book.

Professor Flinn has a happy gift for epitomizing complex arguments with clarity and economy, and is judicious in his handling of questions sometimes dealt with by others in rather *simpliste* fashion, as for example in his discussion of the links between proto-industrialization and nuptiality (pp. 38–39). It will be a boon both to students in need of succinct guidance and to *aficianados* anxious to track down abstruse references or to consult the mass of detailed evidence contained in the appendix tables. Nevertheless, the book is not without certain difficulties, no doubt unavoidable in so limited a compass.

The most serious difficulty lies in the lack of consonance between the empirical data on which Flinn concentrates, the product of family reconstitutions, and the great emphasis that he places on the short-term variability in demographic rates, especially mortality rates. Reconstitution yields information only about very long-term changes, from one half-century to the next at best, so that the principal interpretative thesis of the book does not link closely to the main data presented. The last quarter-century has seen a vast increase in aggregative studies no less than reconstitution exercises, and it is the former which marry best with the study of short-term fluctuations. Constraints of space perhaps prevented the inclusion of data of this type but it leads to some imbalance in what is intended as a general survey, and is also unfortunate in that there have been important advances in techniques of aggregative analysis also in recent years but these are not mentioned in the book.

There are also more particular issues where Flinn's habitual sureness of touch appear to let him down. In the opening description of the technique of family reconstitution, for example, the crucial point that a family may be in observation for different periods for the purpose of measuring different aspects of demographic behaviour does not come over very clearly. Nor is it made clear that the proportion of all events occurring in a parish which are capable of being captured by reconstitution may vary enormously, largely as a function of the length of the period which must be continuously observed to enable the category of behaviour in question to be measured. Thus a very high proportion of all infant deaths will be included in the measure of infant mortality because a family need only be in observation for one year from the date of the child's birth to enable him or her to be included; but the measurement of a phenomenon like age-specific marital fertility will be based on only a small fraction of all legitimate births because the comparable observational rules are much more demanding.

Again, Flinn treats the tendency for early entry into child-bearing to be associated with an early age at birth of last child even in the absence of family limitation (p. 83) as something of a mystery and refers only to an inverse relationship between coital frequency and marriage duration as a possible explanation, though the probable significance of the phenomenon of secondary sterility is well known to demographers (that is, the risk associated with each birth

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process will induce subsequent sterility, which causes high-parity women of any given age to be more likely to have become sterile than lower-parity women of the same age). It is perhaps surprising also that the discussion of methods of detecting the presence of deliberate control of fertility in marriage from the statistical patterns of child-bearing contains no reference to the methods devised in recent years by Coale, an elegant and economical technique which has been shown to be of value in studying small populations, even though better suited to the analysis of big populations.

Finally, the unwary reader may wish to note that the great emphasis placed by Flinn upon mortality crises in curbing population growth in pre-industrial times, and upon the decline in mortality crises in promoting the growth of population in the eighteenth century, does not command universal assent. The debate on this and closely related topics has been pursued since Malthus's day, often with marked vigour, and while there are many who would accept Flinn's view and much evidence to support it, equally cogent arguments and evidence can be produced for other views.

It would, however, be unfortunate and inaccurate to convey the impression that this book is marred by major faults. It is a most valuable addition to the growing number of authoritative studies of European historical demography which have transformed our understanding of the balance between production and reproduction in the past. Great care appears to have been taken over the printing and proofing of the tables, a most welcome virtue, and students of population history have good cause to be grateful to Professor Flinn for his industry, accuracy, breadth of knowledge, and willingness to seek the unifying concept which may serve to "save the phenomena", even when the phenomena are drawn from half a continent over almost half a millennium.

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CHARLES COULSTON GILLISPIE, *Science and polity in France at the end of the Old Regime*, Princeton University Press, 1981, pp. xxii, 601, £22.30.

C. C. Gillispie presents his latest book in these terms: "It is a civil history of work-a-day French science late in the Enlightenment and is meant to be complete" (p. ix). Such a programme would make lesser historians wilt merely in anticipation, but Gillispie evidently relishes his task, which he approaches with admirable thoroughness. Sections are devoted to medicine, botany, map-making, various branches of manufacturing, engineering, agronomy, and much else besides. Remarkably, the author seems at home on all he examines, discussing with great sureness of touch subjects as diverse as, for example, methods of extracting saltpetre, labour-relations in the Montgolfier family's paper-manufacturing business, road-building techniques, the topography of the meeting-place of the Academy of Science, and the symptoms of rabies.

The core of Gillispie's argument is that the ministry of Turgot (1774/5) inaugurated a period of particularly close liaison between government and science. Down to the Revolution, as the government drew increasingly frequently on the discoveries and expertise of scientists it also further legitimized the corporate status and privileges of the different bodies in which scientists were organized. This, together with the tendency for scientific organizations to accord greater importance to providing theoretical training for their members, marked a growth of "professionalization" in all walks of scientific life.

Individual doctors and surgeons crop up here and there throughout the book, but most of the material relating to medicine comes in two lengthy chapters. In 'Science and Medicine' (pp. 187-256), Gillispie depicts the development of the characteristic institutions of the medical establishment - the Faculty and the Academy of Medicine, the Academy of Surgery, the Apothecaries' Company and the College of Pharmacy, whose little-exploited archives he utilizes to good effect. He also describes some of the campaigns in this period in which medical men were prominent (hospital and prison reform, sanitation, public health). In the chapter