The early chapters, beginning with the ubiquitous Bishop Ussher, are largely synoptic. In later ones, Grayson resorts to a finer-resolution microscope. He rounds his sights on the crucial 1810–60 period—bounded by Cuvier's announcement of fossil "time markers", and Boucher de Perthes's forging of a common geo-archaeological context for fixing mankind's antediluvial age. The book comes alive with Grayson's discussion of cave palaeontology, and his technical mastery is evident in his treatment of the vexed question of man's contemporaneity with the mammoth (the book's leitmotif). His informed account illustrates just how complex the interpretation of cave fossils really was. Cuvier dismissed the Gailenreuth cave humans, Frere's stone implements, Guadeloupe man, and Scholtheim's human-rhino cavern assortment; Lyell and Buckland redated Schmerling's "Ethiopian" Engis skull (causing a loss of popular interest which forced Schmerling to remainder his *Researches* as wrapping-paper!); even Darwin rubbished Boucher's book. The volte-face occurred during that extraordinary period when Pengelly's Brixham Cave findings in 1858 sent specialists scurrying across the Channel to re-examine Boucher's Abbéville site. Here, one senses that a contextual study of the Falconer-Prestwich group which invaded France and turned the chronological tables would provide welcome light on why specialists now had little trouble accepting what was anathema to older savants, a human antiquity measured in tens of millennia. This, of course, wasn't Grayson's brief, but it would help to underscore the data-based "resolution" of the antiquity debate that he has so well documented.

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GRAHAM TWIGG, *The Black Death: a biological reappraisal,* London, Batsford, 1984, 8vo, pp. 254, illus., £14.95.

Among the many reasons for the lasting attractions of historical research into earlier periods are the uncertainties which, due to poor or missing documentation, can never be entirely removed and hence continue to provide endless stimulation for informed discussion. There are few areas where this is as self-evident as in that of transmissible diseases. The farther back one goes, the more sketchy and inadequate are the descriptions of epidemics and epizootics left for posterity; often, the authors were laymen, and in most cases clinical descriptions remained less than adequate until well into the eighteenth century. The difficulties are compounded by the reproductive behaviour of micro-organisms; multiplying so much faster than higher forms of life, the number of generations within a given span of time is very high, and the possibilities of mutations and changes in species and sub-species are infinitely rich.

The great plague that swept over Europe from the east beginning in 1347–48, and which came to be known as the Black Death, had long been identified, by historians and medical authorities alike, as bubonic, and probably also pneumonic, plague, although there were inconsistencies in some of the records. Now the zoologist, Graham Twigg, whose special interests include the biology of rats and certain rodent-borne diseases, has written a book in order to persuade us otherwise. He strongly believes he has reasons for dismissing the case for bubonic plague, and suggests anthrax as an alternative. He has examined at length the biological behaviour patterns and the optimum conditions for the existence of the delicately balanced relationships between a number of species of rodents and fleas which are known today as carriers of the plague organism *Yersinia pestis,* first identified, independently, by Kitasato and by Yersin in Hong Kong in 1894.

Twigg examines the reactions of rats and of fleas to prevailing temperatures and other climatic factors and to architectural conditions in recent times, and compares them rather indiscriminately with those of past centuries. Even the wealth of detailed information on rats and associated rodent species, and incidentally on the many different arthropods which may transmit plague, only serves to emphasize the unpredictability of many of the factors which make up the complex fabric of plague epidemics, and consequently the uncertainty of conclusions concerning their presence and behaviour in the fourteenth century. It is not easy to

judge how any species, more than 500 years ago, would have reacted to conditions about which, in any case, we have no absolutely reliable information. A passage on p. 125 illustrates the prevailing confusion: "If *X.cheopis* can then establish itself in the cold of Manchuria [a fact which has been well established in this century] it might be argued that it could have done so in Europe where the winters are much less severe. But the *X-cheopis* colonies which have been found in *modern* [my italics] Europe have almost without exception been sited in the basements of steam-heated buildings." Indeed; but does that necessarily prove anything about their habits in fourteenth-century Europe, where conditions are more likely to have resembled a milder Manchuria and where the absence of steam-heated buildings would have precluded any attempts on the part of fourteenth-century fleas to settle in them?

One cannot argue with Twigg's sound and first-hand knowledge of the biology of rats and their fleas; but one can argue with the way he applies it, and even more with his use of historical sources (and here his curious arrangement of references is less than helpful to the reader). They form a highly individual selection of strictly secondary sources, and nowhere more so than in the final chapter, which purports to present anthrax as a reasonable alternative as the scourge dubbed the Black Death. Twigg's chapter on the black rat in northern Europe is informative and entertaining in its historical content, and its discussion of literary and artistic points such as the considerations of rats in the Book of Kells and in various medieval bestiaries. But, as he himself admits, such depictions are not reliable representations but rather part of an artistic convention, and much of the literary counterparts must remain suspect too. Which brings us to the final chapter and the case for anthrax.

Here he brings in Boccaccio with the vague prefix, "It is said . . .", and the anecdote which follows of the instant demise of two hogs after contact with the belongings of a plague victim is surely apocryphal—it has been repeated countless times and not only in connexion with human epidemics but frequently in epizootics of rinderpest and bovine pleuropneumonia and other more or less unlikely cases, and the unfortunate and doomed two animals involved vary in species from hogs via sheep and goats to cats and dogs. More seriously, Twigg would like us to believe that anthrax might have made the inroads so far attributed to bubonic plague at this time because it attacked populations of animals and man which had not previously been exposed to *Bacillus anthracis*. It would be very difficult to substantiate such a claim. Virgil, in the *Georgics*, described various epizootics of livestock, and one account has a graphic description of the consequences of man handling infected hides. It reads as a surprisingly modern warning; and the chroniclers of epizootics, from Paulet to Fleming and Sir Frederick Smith (none of them among the secondary sources quoted) have not hesitated to identify many earlier and subsequent outbreaks of anthrax.

During the fateful years at the middle of the fourteenth century, there were without doubt any number of infectious diseases present in epidemic and epizootic form, preying on populations of animals and man already weakened by cosmic disasters. Quite possibly anthrax was among them, in company with smallpox, typhus, typhoid, and cattle plagues such as rinderpest and bovine pleuropneumonia; but it is unlikely to have been the main scourge. One very strong argument against the anthrax theory must be the extremely low infectivity of the disease for man, even were we to accept its spread in "air parcels" as suggested by Twigg. According to an authoritative textbook on bacteriology and virology not quoted by Twigg, "man is infected with anthrax only as a result of his dealings with animals or animal products. Methods of prevention must be founded on an understanding of this fact. The infectivity of the anthrax bacillus for man appears to be very low; and it is a common experience that, whenever a case occurs in an industrial establishment, anthrax bacilli can be found, often in large numbers, widely distributed in the environment. The organisms may be inhaled by the workers, without producing obvious disease." Thus, Twigg's main alternative would seem to fit the known circumstances with even more difficulty than bubonic plague.

Elsewhere, Twigg quotes, with apparent unquestioning acceptance, Emmanuel Leclainche, who in his *Histoire de la médecine vétérinaire* (1936) wrote: "Dans la terrible épidémie de variole de 1345–50 (la morte noire, der Schwarze Tod) les chevaux, les moutons et les chèvres meurent par milliers". It is worth noting that the veterinarian Leclainche, who included few

references in this volume, was not always accurate and that by the time he contributed the veterinary medicine chapters to Laignel-Lavastine's comprehensive history two years later, he had removed this paragraph from the section on plagues and contagions in the middle ages which otherwise closely follows his previous volume. This was possibly done with a little help from his medical history friends, who earlier in the same volume wrote of the Black Death: "Sous forme de peste bubonique (peste noire) et surtout de peste pulmonaire, elle tuait au troisième ou quatrième jour".

If finally, unlike Twigg, we were to consult primary sources, one obvious choice would be Guy de Chauliac (*c*1300–*c*1370), who actually lived through the outbreak and survived his attendance on the victims. He distinguished, in separate chapters, between what he called "carboncle anthrax" and other "pustules sanguines, mauvaises, et corrompues", and the great plague (peste). And although "carboncle anthrax" was not necessarily in all cases identical with the anthrax of today, his accurate and detailed descriptions spell out his awareness of one important difference ignored by Twigg; the anthrax pustule and other "carboncles" are primary lesions, whereas in the plague of 1348–50 the buboes were a secondary phenomenon appearing after the initial onset of disease.

For all its statistics and effort, Twigg's case is less than convincing, especially if anthrax is to be put forward as a viable alternative. Much stronger arguments are needed to dissuade historians from identifying the Black Death as bubonic plague alternating with pneumonic plague, as has been observed in modern outbreaks in Manchuria, Transbaikalia, and the Kirghiz Steppes, where bubonic plague occurs during warm weather followed by pneumonic plague during the winter. Pneumonic plague is known to be highly contagious man-to-man, unlike either bubonic plague or anthrax, and to spread with great rapidity in modern outbreaks. Such an explanation would obviate the need to consider too radical changes in the biological behaviour of the vectors and the organism, and in accepted beliefs. At the end of the book, one is left with the impression that the material here presented might have made for an amusing and stimulating essay but that as a book it is a misplaced effort and hardly justifies the claims of the blurb that it is a "revolutionary new examination" making a "convincing case" for rejecting plague in favour of anthrax as the true identity of the Black Death. Convincing, no. Provocative, yes—*vide* the length of this review.

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PHILLIP DE LACY (editor, translator, and commentator), *Galeni De Placitis Hippocratis et Platonis* (Corpus Medicorum Graecorum V 4, 1, 2), Berlin, DDR, Akademie-Verlag, 1984, 8vo, pp. 222, M. 65.00.

This, the third volume, completes Professor De Lacy's splendid edition of one of Galen's most important texts (see this journal 1980, **24,** p. 99f., and 1981, **25,** p. 101). It contains a detailed word index, addenda and corrigenda, and, most valuable of all, a commentary expounding points of medical, philosophical, and stylistic significance. No student of Galen can afford to be without it, for it throws light on to all corners of Galen's activity, especially his philosophical interpretations of medical topics. There is throughout an enviable economy of words and argument, which sets out clearly the commentator's own views, while at the same time pointing to where further discussions and comparative material might be found. The newcomer to Galen may read De Lacy's fluent translation with pleasure; the more advanced reader will be encouraged to seek out more and to think deeply about the problems raised by Galen's interpretation of man.

Naturally enough, in a work of such long gestation, one can add references to recent discussions that, of necessity, were unknown to the editor, e.g. add to the note on p. 380, 13–19, W. D. Smith's discussion in his *The Hippocratic tradition,* and to the comments on Galen's relationship with the Aristotelian tradition and with Alexander of Aphrodisias, pp. 664–666, Paul Moraux's account of Galen in his *Aristotelismus,* II, and my article in *Bull. Hist.*