Book Reviews

Gerald L Geison, *The private science of Louis Pasteur*, Princeton University Press, 1995, pp. xiv, 378, illus., £24.95, $29.95 (0–691–03442–7).

Gerald Geison's superb study of Louis Pasteur comes at a time of mounting hysteria over the supposedly anti-scientific intent of much history and sociology of science. In such a climate, there is a danger that a book which sets out to show that Pasteur's "scientific beliefs and modus operandi were sometimes profoundly shaped by his personal concerns, including his political, philosophical, and religious instincts" (p. 4), and which argues, moreover, that, on occasion, Pasteur deliberately published misleading accounts of the work that led up to some of his most important scientific discoveries, will be dismissed out of hand by the anti-sociology lobby. Anyone who takes the time to read Geison's judicious, meticulous and carefully argued book will be forced to reassess such charges. *The private science of Louis Pasteur* makes abundantly clear the extent to which a thoroughly social understanding of Pasteur's science is compatible with a deep admiration for the skill and dedication that he brought to his work, and for the immense fruitfulness of the research programmes that he initiated.

It does so, however, while providing a much-needed corrective to some of the uncritically adulatory tales that have hitherto been told about Pasteur's life and work. Pasteur has been the subject of much myth-making. Thanks to the stories that he, his colleagues and his biographers told about his endeavours, he has been hailed by posterity, not just as an outstanding scientist, but as something of a moral paragon—"the most prefect man who has ever entered the Kingdom of Science . . . a man whose spiritual life was no less admirable than his scientific life", as one hagiographer put it (Stephen Paget, 1910, quoted at pp. 265–6). Such myths have played a powerfully ideological role in consolidating the social authority that scientists currently enjoy. But they have also tended to conceal much of the story of how scientists such as Pasteur actually acquired their pre-eminent role in the culture of their time.

Geison sets out to de-mythologize Pasteur by providing a series of detailed studies of key episodes in his rise to scientific pre-eminence, based on a careful analysis of Pasteur's own laboratory notebooks as well as his published work. He begins with Pasteur's earliest major discovery—that optical activity among the tartrates was correlated with their ability to produce asymmetric crystals. Thereafter, he goes on to discuss Pasteur's work on fermentation and on spontaneous generation, and his later success in developing first an effective anthrax vaccine, then a vaccine to treat rabies. Throughout these chapters, Geison shows how Pasteur's experimental work was inspired and informed, on the one hand by his desire to vindicate a deeply held assumption that vital processes differed qualitatively from non-living physical and chemical processes, and on the other hand by his more pragmatic concern to produce effective new medical technologies.

Geison is particularly interested in the way Pasteur prepared his findings for public consumption. A detailed reading of Pasteur's published experimental reports reveals the extent to which published accounts of his work often glossed over or concealed the actual processes of thinking and experimentation recorded in his private notebooks. Geison demonstrates how Pasteur commonly edited his own experimental results to include in the public record only those which supported his own preconceived ideas, and how he explained away contrary findings—his own and others'—as the results of faulty experimental methods. As Geison stresses in his introductory chapter, such rhetorical techniques are a normal part of the process of preparing scientific findings for public discussion; indeed, they are essential if

scientific debate is to move beyond experimental particularities to the consideration of more general theoretical issues. But Geison also discusses two instances in which Pasteur's private interests led him to behave in ways which might be regarded as downright dishonest. On occasion, Pasteur not only edited his results, but gave deliberately misleading accounts of the experimental practices that had enabled him to generate those results.

The first such episode involves Pasteur's dramatic public demonstration of the efficacy of his anthrax vaccine at Pouilly-le-Fort in June 1881. The basic outline of this event, in which twenty-five vaccinated sheep survived injection with a virulent strain of anthrax bacillus while twenty-five unvaccinated sheep died of the disease, is well known. Pasteur's published accounts of the experiment are written in such a way as to suggest that the vaccine was prepared by exposing anthrax cultures to atmospheric oxygen, which had the effect of attenuating the virulence of the microbe. But Geison's research in Pasteur's notebooks reveals that the vaccine used at Pouilly-le-Fort was actually prepared by the rather different method of exposing the bacillus to an antiseptic, potassium bichromate. Pasteur's deception was motivated by scientific rivalry. He was concerned that credit for his discovery should not be shared with another researcher, Jean-Joseph Henri Toussaint, who had himself attempted to create an anthrax vaccine by exposing the bacillus to antiseptics. To that end, Pasteur misrepresented his own discovery as the outcome of a systematic research programme based on his earlier success with oxygen attenuation of the fowl cholera microbe, and concealed the fact that he had been forced to resort to methods that were much closer to those practised by Toussaint.

Geison uncovers a similar deception in Pasteur's account of his discovery of the rabies vaccine. Again, historians are familiar with the basic story of how Pasteur first demonstrated the efficacy of his vaccine by successfully treating a young shepherd, Joseph Meister. But Geison shows that Pasteur's public account of that experiment was carefully drafted to obscure the fact that it violated prevailing ethical standards for the conduct of human experiments—standards that Pasteur had himself but recently endorsed. In describing the work leading up to the first successful human trial, Pasteur suggested that he had previously tested both the safety and the efficacy of his method on a "large number" of dogs. In fact, Pasteur's laboratory notebooks reveal that his previous attempts to treat dogs with rabies vaccine had yielded results that were ambiguous at best, and that none of those animal trials had been conducted using the method that was used to treat young Meister. Joseph Meister, it turns out, was treated using a method that Pasteur had only recently decided to try, and that was completely untested on animals. Had the truth come out at the time, it might well have inflamed public fears that laboratory scientists like Pasteur were recklessly inclined to disregard more humane considerations in their pursuit of scientific knowledge or commercial gain. In the event, such fears were allayed by the evident success of the rabies vaccine. Nevertheless, in his desire to secure that success, Pasteur saw fit both to violate his own professed ethical standards, and to mislead the public about the methods he had employed.

In revealing these discrepancies between Pasteur's private activities and the accounts he subsequently published of those activities, Geison's aim is not to discredit Pasteur or his contributions to science. On the contrary, he gives full credit to Pasteur's brilliance as an experimeter. But he also makes clear the extent to which Pasteur's public reputation depended not just on his ability to manipulate his experimental materials in the laboratory, but also on his ability to control and manipulate the information that issued from his laboratory. Pasteur's science is thus portrayed as an irreducibly social enterprise, involving both the scientist's pursuit of his private interests and ambitions, and the more public system of scrutiny, criticism and approval that defined the terms on which his success was to be

measured. In demonstrating this interaction between public and private activities, Geison goes to the heart of what makes science so powerful a means of generating not just experimental novelty, but also effective new technologies for ordering and controlling the world. But in making clear the extent to which even so great a scientist as Pasteur was tempted, on occasion, to conceal the truth about the methods he used, Geison also raises important questions about how the essential tension between public and private interests is to be managed.

Geison does not address these questions explicitly; he is content to let his readers draw their own conclusions from his analysis of the private dimensions of Pasteur's work. Nevertheless, his study has profound implications for how we should think about the place of science in contemporary society. Over the past forty years, the myth of disinterested science has lost much of its popular appeal. The public is now far more aware of the partisan nature of scientific research, and of the extent to which the interests of the organizations that support such research may diverge from the interests of other sections of society. At the same time, science has become an increasingly private activity; not only is more and more research conducted within private institutions, but even academic science is now being diverted towards the goal of private wealth creation. Consequently, there is a crying need for informed discussion about what sorts of social structures will best ensure that science continues to serve the interests of the public at large. Such discussion cannot be advanced by retailing bankrupt myths about scientific integrity and disinterest; rather, we need to develop and disseminate a proper awareness of the social processes on which a truly public science must be founded. Geison's incisive deconstruction of the Pasteurian myth, and his elucidation of the role of both public and private interests in securing Pasteur's success, takes us a considerable way towards fulfilling this aim.

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Richard H Ellis (ed.), *The case books of Dr. John Snow, Medical History*, Supplement No. 14, London, Wellcome Institute for the History of Medicine, 1994, pp. lvii, 633, £25.00, $38.00 (0–85484–061–3).

This large volume presents a complete transcription of the three surviving case books kept between 1848 and 1858 by the English physician John Snow, known best for his epidemiological studies of cholera but also for his early proselytism for anaesthesia. Preserved at the Royal College of Physicians, these records become more readily accessible in this published edition. Richard Ellis's splendid introduction traces Snow's career and begins to display the historical yield his manuscripts afford. The edition is enhanced by indexes and a brief essay by M P Earles on mid-nineteenth-century prescribing conventions.

Snow's entries record visits in the order he made them, arranged, that is, as a daybook chronicle of his professional activity rather than as narratives of illness and treatment in individual patients. Notations about his general practice are terse, sometimes specifying a diagnosis and prescription but often little more than the patient's name. Much fuller are his accounts of administering anaesthesia, though these too range from a short sentence to several richly detailed paragraphs. The record of the first eighteen months of Snow's use of anaesthesia has been lost, but the extant journals powerfully open up the workaday medical and social realities of an active anaesthesiological practice spanning most of the decade after the 1846 introduction of anaesthesia.

The sheer diversity in Snow's practice is impressive. We encounter him administering chloroform (or sometimes amylene) for an extraordinary array of conditions, including excision of tumours, removal of bladder stones, amputations, childbirth, and especially extraction of teeth. We see him anaesthetizing patients ranging from 8 days to 87 years in age and from workhouse inmates to Queen Victoria. The variety of sites where Snow