

SCIENCE, SCIENTIFIC MANAGEMENT, AND THE TRANSFORMATION OF MEDICINE IN BRITAIN c. 1870–1950

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Historians still have no satisfactory general account of how the laboratory sciences came to occupy their privileged place in modern medicine. Older positivist accounts supposed the answer to be self-evident: from the mid-nineteenth century, doctors embraced the new sciences because they saw them as yielding unequivocal improvements in the power of medicine to diagnose, treat and prevent illness. But scholarly work in the history of science and medicine has rendered such accounts untenable, and has begun to explore a rather different sort of explanation. John Harley Warner sums up the current state of play in a recent historiographical review: "The idea that advances in science brought increased medical efficacy and that this in turn elevated the standing of the medical profession — once largely taken for granted — has been soundly challenged by the proposition that it was the cultural more than the technical value of science that propelled change."¹ Warner's review is not concerned solely with the laboratory sciences; indeed, one of the main aims of his paper is to remind his readers that the "sciences of medicine" have included, and still include, far more than just the modern disciplines of the laboratory. But it is above all in relation to the rise of the laboratory sciences, whose scientificity is least open to question by present-day observers, that positivist arguments have been proposed and subsequently challenged. Warner cites a growing body of historical studies that give considerable empirical weight to this proposition.² However, he goes on to observe that these studies themselves raise "fundamental questions that remain largely unanswered".³

Most notably, historians tend to suppose that the cultural value of science must be located in the realm of "ideology" or "rhetoric", having "as much to do with the idea of science as with its content".⁴ On this view, the rise of medical laboratories is to be explained by arguing that the medical profession adopted them primarily as symbols of scientificity, with the aim of impressing patients and enhancing doctors' cultural authority. But as Warner points out, such explanations beg the question why "the idea of science" should have enjoyed such popular respect: "to understand how [a display of scientificity] elevated the authority of the medical profession

we also need to understand just why the ... public bought it."³ Moreover, by regarding cultural values as merely rhetorical or ideological, historians have tended to neglect the obvious fact that laboratories are not just symbols of scientificity; they are also sites for the production and dissemination of medical knowledge and techniques, and for the conduct of such forms of medical work as diagnosis and monitoring. Science, Warner reminds us, is not just an "ideological commodity"; it is also "a technical ... resource".⁶ "Saying that the ideal of science was more important than the reality — however warranted — begs the question of just how science altered clinical cognition and activity." In short, much might be gained by asking how the growth of medical laboratories related to changes in doctors' "patterns of thought and behaviour".⁷

This paper is intended to address precisely these questions. Our contention is that, in Britain between about 1870 and 1950, the laboratory-based medical sciences were taken up and promoted as part of a broader process of change in the social organization and social relations of medical practice. In the first two sections, we outline what we take to be the key aspects of this broader cultural transformation, which we characterize as the rise of medical corporatism. Medical practice in 1870, we argue, was structured chiefly around individualized competition for patients at the lower end of the profession, and around a close-knit network of elite patronage at the upper end. By 1950, it had been replaced by a corporate system of mass health care, organized as a vertically integrated hierarchy of relatively specialized practitioners and animated more by a managerial concern with collective efficiency than by the pursuit of patronage or individual competitive advantage.⁸ As we make clear, the growth of corporatism in medicine as in other spheres of activity was driven, not by the impact of new medical knowledge or techniques, but rather by social, economic and political pressures.

Our third section is devoted to showing how an understanding of this social and cultural transformation can help us to explain the development of the medical sciences. Insofar as historians have considered the relationship between medical science and the organization of medical practice, they have tended to treat science as autonomous and independent. Thus, for instance, they have generally assumed that the emergence of new medical specialisms was a consequence rather than a cause of the growth of scientific knowledge.⁹ Recent studies have begun to take a more instrumentalist approach, arguing that the advocates of specialization adopted and promoted new laboratory-based definitions of illness as a way of demarcating and claiming authority over their own preferred areas of special expertise.¹⁰ But such studies still tell us little about why would-be specialists should have favoured the laboratory sciences over other forms of esoteric knowledge. Equally, while a number of researchers have begun to look beyond specialization to explore the development of what we would identify as specifically corporate forms of medical organization, in general they have continued to treat scientific expansion and innovation purely as one among a number of contributory causes.¹¹

By contrast, the possibility that the emergence of new forms of medical

organization might, conversely, have influenced and informed the development of medical science has received little attention from historians. In the third section of this paper, however, we argue that it is just such a relationship that provides the key to understanding the rise of the laboratory sciences. Our claim is that doctors and medical policy makers supported research and teaching in the laboratory sciences, and the importation of laboratory techniques into medical practice itself, primarily because they saw them as a means of promoting administrative efficiency within the emerging system of corporate health care. Specifically, they saw medical laboratories as embodying a way of knowing — characterized by a logic of diagnostic categorization and therapeutic standardization — that was peculiarly suited to the administrative requirements of such a system. In advancing this claim, we do not seek to imply that this administrative way of knowing was a necessary corollary of the pursuit of laboratory-based techniques of research and practice. On the contrary, we are careful to show that the intellectual and practical orientation of the laboratory sciences itself depended on and was informed by the particular social and cultural milieu in which they developed. But as we will argue, in the long run it was the emerging administrative culture of corporate medicine that provided the most fertile milieu for the growth of the medical sciences.

In pursuing this line of analysis, we seek to demonstrate that the growth of the laboratory sciences was encouraged because they could be used to generate technical knowledge and practices that served particular cultural ends. But it is important to stress that we do not regard the cultural dimension of science as a matter of disembodied ideology or rhetoric. Rather, we show that the new sciences were valued because they offered an effective way of ordering and managing, at one and the same time, both the natural phenomena of disease and the social and cultural relations of medicine. By looking at the development of the sciences in this way, we are able to collapse the distinction between technical and cultural values that has been so prevalent a feature of recent historiography of medical science.

In linking the rise of laboratory science with the pursuit of administrative efficiency in medicine, we are talking, we would argue, about the rise of scientific management. Our use of the term differs somewhat from the way that it is commonly interpreted, however. A number of medical historians have noted that late nineteenth- and early twentieth-century reforms in the administration of American hospitals and clinics were frequently prosecuted under the banner of something called "scientific management".¹² But these historians have not, in general, traced any direct connection between scientific management and the methodologies or specialist knowledges associated with the new laboratory sciences.¹³ Rather, they tend implicitly to follow the view, common among historians of business and industry, that scientific management was little more than a body of specifically managerial techniques — including Taylorite time-and-motion studies, record keeping, cost accounting and so on — which managers simply labelled "scientific" in order to appropriate something of the wider cultural authority that is supposed to have been associated with the name of science.¹⁴ In this respect, historical accounts of

the emergence of scientific management follow the same kind of "cultural value" argument as is current among historians of medicine more generally.

Our own view, discussed in the conclusion, is that the concept of scientific management needs to be expanded to take account of the very real connections between the development of science and the growth of management that we explore, for the case of British medicine, in this paper. Managers and administrators did not just invoke the name of science to dress up their own practices; they also made use of the knowledges and techniques that science yielded. Within medicine, developments in the laboratory sciences were pursued and supported in large part because they contributed to the efficient management of patients and of the various institutions within which patients are treated. The growth of the laboratory-based medical sciences was not incidental to the pursuit of managerial and administrative efficiency in medicine; it was part and parcel of it.

1. PHILANTHROPY, MANAGEMENT AND THE VOLUNTARY HOSPITALS

Efficiency became an abiding concern within the voluntary hospitals from the last third of the nineteenth century.¹⁵ Founded a century earlier, these charitable institutions had their origins in the social transformations of the mercantile and industrial revolution. By dispensing medical charity through the hospitals, the new urban élite sought to inculcate a sense of gratitude and deference among the poor, thereby consolidating their own social status and reinforcing the social order.¹⁶

It was widely supposed that these philanthropic functions were best served if charity took the form of a face-to-face transaction between donor and recipient; the more personal the gift, the deeper the sense of obligation. This personalized philanthropic culture was reflected in the running of the hospitals. The admission of patients to the wards was controlled by a system of subscribers' tickets, which were dispensed either by the donors themselves or by their personal representatives — usually members of the clergy or the magistracy. Hospital donors also served as members of the boards of governors, with responsibility not just for overseeing the management of the hospitals and appointing the medical staffs, but also for much of the day-to-day administrative business.

From about the mid-nineteenth century, however, this philanthropic culture began to be restructured as members of the new professional middle classes asserted their own claims to be involved in running the hospitals. These claims turned in part on a redefinition of the philanthropic role of the hospitals, which emphasized the importance of new forms of technical and administrative skill. Increasingly, the hospitals were conceived, not just as a way of mediating the politics of obligation, but also as a way of imposing a strict and salutary moral discipline on the inmates. Such attitudes were apparent, for example, in the reform of nursing practice, and in the greater ordering and segregation of patients by new forms of architecture which literally restructured hospitals in the interests of efficient moral management.¹⁷ They also informed attempts to reform the admission of outpatients. Unlike inpatient

care, which remained largely under the personal control of subscribers, outpatient provision was increasingly being made available free of charge to all who presented themselves at the hospital. From the late 1860s, however, charity reformers argued that this system was inefficient, both financially, in that it led to a squandering of charitable funds on individuals who could afford to pay for private health care, and socially, in that the indiscriminate provision of charitable assistance undermined the incentive to exercise moral and financial self-discipline. One solution to this problem of "outpatient abuse" was to appoint hospital almoners, who would regulate access to outpatient services by conducting detailed investigations into the financial and moral circumstances of claimants.¹⁸

Similar concerns with efficiency also resulted from the hospitals' increasingly close links with industry and business. From about mid-century, industrialists began to take a growing interest in the running of the hospitals, which they saw as a means of maintaining both the moral and physical health of their workers.¹⁹ Hospital governors now began to delegate the running of their institutions to a new breed of hospital managers imported from the world of finance and business.²⁰ These managers stressed the economic advantages of applying business principles to medical charity, and were responsible for introducing systems of uniform accounting into their hospitals.²¹ They went on to promote similar economies across groups of institutions through such organizations as the British Hospitals Association (established in 1884) and the King's Fund for London (1897) — the latter founded specifically to eliminate wasteful duplication of hospital services in the metropolis and to create "a new generation of capable, well-paid professionals who would revamp hospital management".²² The new managers also took a close interest in the administration and rationalization of the new workplace contributory schemes — notably the Hospital Saturday Funds — that began to be established from the 1870s.²³ Such schemes provided a much-needed source of funds for the voluntary hospitals, but they also contributed to the growth of managerialism within hospitals — both directly, by involving workers' representatives and factory managers in the regulation of admissions, and indirectly, by apportioning funds "according to the work, economy and efficiency of the different institutions".²⁴

Increasingly, the face-to-face philanthropic culture of the hospitals was being replaced by new layers of hospital administration and new criteria of clinical effectiveness. Doctors, too, were implicated in this process, and from about the mid-nineteenth century began to look for ways of improving the efficiency and productivity of their practices. This was particularly evident in surgery, where complex operative procedures lent themselves to new forms of work management. Such innovations were often directly inspired by developments in industry and business. A case in point was the Birmingham surgeon Thomas Spencer Wells, who was hailed by his peers for the "precise methodological plans and steadfast business-like habits", modelled on the division of labour in the local craft industries, that he brought to his hospital practice.²⁵ Even in the absence of such overt emulation, it would seem that ideas of business organization held a pervasive appeal. By about

1900, for instance, it had become common practice for senior hospital surgeons to marshal the junior doctors training under them into formal hierarchies, among whom they divided responsibility for different aspects of the clinical work. The term adopted for this form of organization — “the firm” — carried clear overtones of business management.²⁶

That considerable efficiency savings could be secured by such reorganization of clinical work was abundantly clear. In Liverpool during the early 1900s, the surgeon Robert Jones reorganized his clinic at the Royal Southern Hospital into a showpiece of managerial efficiency, enabling him to handle staggeringly heavy caseloads of injured dockers. As one of his colleagues proudly recalled:

[Jones] got through an immensity of work, ... rendered possible by the systematic preparation of the patients and by the work of the anaesthetists who had each successive patient ready by the time the operation on its predecessor had been completed.... He had round him a number of helpers, some of them medical men glad of the opportunity to get experience, others consisting of a nursing staff trained in the application of splints and plaster-of-paris. ... other workers who had received some training kept an eye on the home conditions of the patients with reference to their feeding and regular attendance for massage, or other special treatment, at the Hospital.²⁷

Such observations were echoed by dozens of American surgical visitors to Jones's clinic, who hailed his meticulous delegation of labour, and the enormous increase in productivity it made possible, as the epitome of modernity in medicine.²⁸ Clearly, Jones was an extreme case. But he serves to exemplify an organizational logic of efficiency that was being pursued with more or less enthusiasm in hospital clinics throughout the country.

The development of an increasingly formal and refined division of labour in clinical practice was usually accompanied by a significant measure of specialization in the kinds of cases handled. From the late eighteenth century, hospital practice had been divided between physicians and surgeons according to the kind of care and treatment deemed most suitable for each particular case. But this division of labour was determined, not by functional considerations of efficiency, but rather by the persistence of older occupational identities. By the 1870s, however, some clinicians were beginning to specialize further. Such specialization plainly contributed to the pursuit of efficiency. This was most obvious in the case of surgery, where it enabled practitioners to hone their technical skills and streamline their operative procedures to a degree that was not possible in unspecialized practice. Thus, for instance, Wells's skill and efficiency as an ovariologist established his reputation, from the 1870s, as one of the country's leading gynaecologists, while Jones concentrated almost exclusively on orthopaedic cases.

It is important to recognise, however, that moves towards specialization — and hence towards technical efficiency — in hospital practice tended to be restricted by countervailing pressures within the culture and social relations of elite medicine.

Indeed, many hospital doctors were deeply ambivalent and even hostile towards the emergence of specialization and the changes it implied in the social relations of hospital work. Their concerns related particularly to the impact such changes would have on existing patterns of *élite* private practice.

In general, doctors were not paid for their work in the voluntary hospitals; they gave their services gratuitously, ostensibly as an act of charity. Nevertheless, appointments to hospital posts were much sought after, chiefly for the *entrée* they provided into the world of the philanthropic *élite*, among whom a hospital doctor could expect to establish a lucrative private practice. From the early nineteenth century onwards, *élite* private medicine had thus been organized largely within the culture of philanthropic paternalism and face-to-face social relations that obtained in the voluntary hospitals; private practices were built up primarily by cultivating close personal relationships with local philanthropists, and were more a matter of patronage than trade. This had implications for the kind of medicine *élite* doctors favoured. In their private practices, those with hospital posts in surgery as well as in medicine tended to assume the role of personal physician, closely involved in managing their patients' ills from the most trivial to the most serious. Indeed, for all that nineteenth-century hospital doctors adopted the title "consultant" to distinguish themselves from the more lowly class of "general practitioners" (or "GPs"), this was more a distinction of status than of function; by and large, consultants remained generalists in their private practices.²⁹

Many doctors saw the rise of specialization from the mid-nineteenth century onwards as threatening the social basis of *élite* private practice. The threat was most dramatically represented by the kind of entrepreneurial specialization that began to flourish, particularly in London, from about the 1860s. Enterprising young doctors, frustrated by the restricted opportunities for professional advancement available in the voluntary general hospitals, sought an alternative route into private practice by setting up their own specialist hospitals and proclaiming their expertise in particular fields of medicine. Such practice was widely condemned by generalist consultants, who feared that it would undermine and fragment the cosy and exclusive world of *élite* medicine. Specialization smacked of commercial practice and of free-market competition; instead of relying on established networks of patronage, it involved an appeal to public credulity that came close, in the eyes of the generalist *élite*, to quackery.³⁰

Specialization was seen as a more acceptable strategy in the provinces, where *élite* doctors did not have access to the same concentration of wealthy patrons as was available in the metropolis. For these practitioners, specialization held out the possibility of establishing a practice that extended beyond the confines of local philanthropic circles, to encompass a wider geographical area and a larger population. Spencer Wells and Robert Jones were just two of the provincial surgeons who benefited from this strategy. Others included Harold Stiles of Edinburgh, Rutherford Morison of Newcastle, and Berkeley Moynihan of Leeds. Some metropolitan surgeons adopted a similar strategy, including Victor Horsley of University College,

London, who specialized in neurosurgery from the 1890s, and subsequently allied himself with Jones's and Moynihan's efforts to reform surgical practice.³¹ Nor was specialization restricted to surgeons. Provincial physicians, too, saw it as a way of establishing a reputation and a practice that extended across whole regions of the country. Notable examples are Clifford Allbutt of Leeds, who argued as early as the 1870s for greater specialization within hospital practice; and J. S. Mackenzie of Burnley, who established a highly successful consulting practice in cardiology.³²

It is notable, however, that these doctors adopted a less aggressively entrepreneurial approach to specialization than many in the metropolis. In the first place, they did not usually resort to setting up separate specialist institutions. Rather, they tended to work from within the voluntary general hospitals, where they commonly took responsibility for general medical and surgical wards, thus tacitly endorsing the view that specialization should develop from rather than supplant general practice. Secondly, they generally sought to build up their private practices, not by appealing directly to the public, but by encouraging referrals from other doctors, including general practitioners and fellow specialists. Specialization, in this form, was less about opening up the profession to free-market competition than about transforming the existing hierarchy of medical status into a regionally integrated and functionally defined division of labour. It proved to be a successful strategy. By the early twentieth century, the new division of labour was becoming an accepted part of élite practice; many hospital doctors were able to give up their general practices and rely solely on referrals, while the concept of "the pure consultant" was adopted to distinguish this new class of doctors from the élite generalists who had previously staffed the hospitals.³³

The result was an effective accommodation between the old culture of face-to-face philanthropy and medical generalism on the one hand, and the new culture of professional managerialism and division of medical labour on the other. Thus, despite the growing autonomy of hospital administrators, the voluntary hospitals remained a focus for élite philanthropic activities right up to their nationalization in 1947. Throughout this period, some metropolitan consultants continued to earn small fortunes as general practitioners to the rich and famous.³⁴ Even specialists still extolled the virtues of generalism: Robert Jones, for instance, was described as belonging to "that type of specialist who had been, and continues to be, a general surgeon, but has been forced by the large amount of work to become a specialist";³⁵ while an honorary post in a voluntary general hospital remained the acme of professional success even among those who had built their careers in the new specialist institutions.³⁶

In effect, the general hospitals succeeded in integrating a degree of specialization into a system that still gave priority to general medicine and surgery. This accommodation was reflected in the changing rhetoric of generalism. Articulated in the mid-nineteenth century as a bulwark against specialization, claims for the essential unity or integrity of medicine were increasingly deployed, not so much to defend élite general practice, as to assert the need to integrate a specialized division

of medical labour into a single and hierarchical system of health care — a function which the general voluntary hospitals, in particular, purported to fulfil.³⁷ Thus professional opposition to special hospitals now gave way to calls for such institutions to collaborate more closely with — and even reconstitute themselves as special departments of — the general hospitals.³⁸

Within the general hospitals themselves, however, the identity of the élite general surgeon and physician remained sovereign. In this respect, it is notable that the establishment of specialist departments proceeded fastest in outpatient clinics, where the philanthropic work of the hospitals approximated most closely to a form of mass health care provision rather than face-to-face paternalism, and where the pressure for efficient patient management was greatest.³⁹ Nor was there much integration of the work of physicians and surgeons across the special and general wards of the hospitals. Patients remained, in effect, the property of individual consultants and their “firms” of junior and trainee doctors. This reluctance to establish a systematically coordinated division of specialist labour within the hospitals is apparent in the relatively slow development of patient records. Whereas in America by 1920, standardized record cards had been widely adopted as a means of integrating the increasingly disparate tasks of diagnosing, caring and curing — serving, in effect, as a surrogate for the whole patient — in Britain clinical records continued to be held by individual consultants, while their form and content varied widely within as well as between institutions.⁴⁰

Nevertheless, as we have seen, between about 1870 and 1920, different professional groups within the voluntary hospitals came to share an interest in establishing what, following Leslie Hannah’s analysis of developments in business, we might call an increasingly corporate system of medical management.⁴¹ For the new vanguard of business-minded managers, such a system enabled them to assume a pivotal role in running institutions that were tailored to the expectations, not just of private philanthropists, but also of organized charity, of industrialists, and of mass contributory schemes. Meanwhile, for a significant section of the medical élite, the promotion of a new division of technical labour helped them to refine their identity as consultant experts, ministering to the needs, not just of patients within the hospitals and their immediate benefactors, but of a much wider community beyond. For both, the pursuit of new techniques of management — be it of hospital finances or of patients — provided a way to secure a considerable measure of professional autonomy and responsibility within an increasingly corporate and efficient system of medical care. It also involved at least a partial transformation in the social relations of medicine; where the work of the hospitals had initially been defined in terms of face-to-face philanthropy and individualized medical care, the relationship between donors and recipients of medical care was now mediated by increasingly standardized administrative structures and an increasingly formal and functional division of medical labour.

As we have argued, this transformation had its roots in the rise of corporate business and large-scale industry, which hospital managers and clinicians both served

and emulated. It should be stressed, however, that the logic of corporate management was not followed through to anything like the same extent in the hospitals as it was in business and industry. Rather, it was countered by the continuing — if diminished — influence of wealthy donors in the running of the hospitals, and by the persistence of a culture of patronage in large areas of elite private practice. In effect, by the inter-war period, the hospitals had come to embody something of a compromise between the two cultures of corporate business and elite philanthropy. But by this time, they were coming under pressure for further reform from a new source, namely an increasingly interventionist state machinery. Consequently, before we can begin to comprehend the place and significance of the laboratory sciences in the transformation of medical culture at this time, we also need to examine developments that took place within the sphere of public administration.

2. RATIONALIZATION AND THE STATE

Efforts to promote efficient management of medical resources did not originate solely in business and industry, and were not restricted solely to the running of the voluntary hospitals. They also developed within an expanding state machinery, and found expression in a concern with the efficient provision of medical services more generally. Government administrators were preoccupied with reducing waste and inefficiency in the provision of public services from at least the early nineteenth century. This was particularly evident in the reform of the Poor Law, which remained the major provider of public assistance throughout the Victorian era. Poor Law reformers, as much as charity organizers, were chiefly concerned to prevent improper use of the various destitution services — including the provision of food and shelter, schooling and medical care — by those who were judged capable of providing for themselves. Notoriously, the 1834 Poor Law Amendment Act was intended to secure this end by pursuing a policy of so-called “less eligibility”: poor relief was rendered less attractive or “eligible” than self-help by the imposition of deterrent or punitive penalties, including the loss of civil rights and subjection to the harsh regime of the workhouse.⁴²

As well as placing deterrent barriers around access to poor relief, reformers also sought to promote efficiency within the Poor Law by differentiating, systematizing and coordinating the various services. As early as the 1840s, Edwin Chadwick called for the general workhouse system to be reconstructed as a set of specialized schools, hospitals, asylums and almshouses, which he supposed would constitute a more rational system of local government services.⁴³ His call for the creation of a distinct Poor Law medical service was seized upon by professionalizing doctors, who saw it as an opportunity to enhance their status and their prospects as medical managers of the proposed new public institutions.⁴⁴ By the 1860s, some of the more progressive provincial Boards of Guardians had begun to build infirmaries separate from the workhouses, and this tendency was formally endorsed by the passage of central enabling legislation later in the decade.⁴⁵

The doctors' campaign for improved medical provision under the Poor Law was backed up by claims that appropriate forms of medical management could effect a significant reduction in the cost of poor relief. It was widely believed that ill health and infirmity were themselves major causes of destitution. Consequently, doctors were able to argue that prompt and effective medical treatment would enable the sick to regain their independence as quickly as possible, and would thereby do much to lighten the burden on the poor rates.⁴⁶ Such arguments were not universally accepted; many Poor Law administrators held fast to the view that only a minimum standard of public assistance should be made available, with access restricted to only the most desperate cases. Nevertheless, many localities saw fit not only to improve their Poor Law medical facilities, but also to ease the conditions of access to encourage early applications for treatment. In 1885, central legislation was passed which significantly weakened the deterrent penalties imposed on recipients of Poor Law medical relief.⁴⁷ Use of the Poor Law medical services increased accordingly: by the end of the century, the number of beds in Poor Law institutions far exceeded those provided by the voluntary hospitals; indeed, one witness was able to tell the Royal Commission on the Poor Laws, appointed in 1905, that the infirmaries were "fast becoming rate-aided hospitals" for the whole of the working class.⁴⁸ In a context of mounting concern over the nation's industrial, military and imperial competitiveness, doctors were now being credited with an increasingly important public role in managing the health of the population.

Meanwhile, a number of other new state medical services were being established outside the Poor Law. An important factor was the creation, from the 1870s, of a new tier of municipal government, responsible among other things for the implementation of public health measures. The new authorities were required to appoint Medical Officers of Health (MOsH) to oversee the sanitary aspects of local government work, and a separate medical department of the central Local Government Board was set up, initially under the aggressive leadership of John Simon.⁴⁹ This new cadre of public health doctors proved, on the whole, to be remarkably effective in fostering the growth of medical services both locally and nationwide; in particular, they championed the proliferation of isolation hospitals for infectious disease cases that local public health committees began to establish from the 1870s.⁵⁰ Elsewhere in the machinery of government, the local education authorities, under the central control of the Board of Education, took charge of school health inspection and school clinics from 1907; the Lunacy Commissioners dealt with the insane; the Home Office superintended workmen's compensation and factory health and safety; while the War Office and later the Ministry of Pensions funded rehabilitative treatment for war casualties. Most importantly, the 1911 National Health Insurance Act created a system of state-assisted GP care for large sections of the working class, under the administrative control of central National Insurance Commissions and local Insurance Committees.⁵¹

The result of these piecemeal initiatives was a proliferation of state medical services that was at odds with Chadwick's original vision of a rational system of national

and local government. By the first decade of the twentieth century, however, Poor Law doctors, MOsH and central government reformers were joining forces to demand that the various medical services should be brought under a single central health ministry.⁵² The existing patchwork of administrative agencies was highly inefficient, they objected; by 1914, for instance, at least three central and eight local government departments had responsibilities for maternal health, leading to duplication of services and administrative confusion.⁵³ Proposals for the creation of a central government department to take charge of all matters pertaining to health had been put forward on a number of occasions during the nineteenth century, not least by Chadwick.⁵⁴ But they acquired new urgency from about 1900 in the context of mounting public concern over national efficiency — a concern which not only fuelled official interest in the health of the population, but which also turned a spotlight on waste and inefficiency within government itself. Though the rationalization of the machinery of government had repeatedly been discussed in Royal Commissions and other official bodies from the 1850s, it was prosecuted with especial vigour during the first two decades of the twentieth century.⁵⁵ The campaign for a Ministry of Health was the most obvious beneficiary of this governmental self-examination; the new Ministry was finally established in 1919, when it took over the responsibilities of the Poor Law and medical departments of the Local Government Board, the National Insurance Commissions and various other official agencies.⁵⁶

The architects of the Ministry of Health were not just concerned with rationalizing the administrative machinery of state medicine; they also sought greater coordination and efficiency in the actual delivery of medical care. One means of securing that end was to establish a unified system of medical care, spanning both domiciliary and institutional treatment, by encouraging the development of an integrated and hierarchical division of labour between GPs and hospital consultants. In 1920, a Report from the Ministry's Consultative Council on Medical and Allied Services — the famous Dawson Report — gave formal expression to such views by defining distinct primary and secondary health-care roles.⁵⁷ GPs should no longer seek to meet all the medical needs of their individual patients; rather, as primary practitioners, they should deal only with relatively routine and straightforward cases of sickness. Such cases as fell outside this restricted sphere of competence should be referred for special investigation and therapy to consultants working in outpatient clinics and residential institutions. The Dawson Report envisaged that this system of secondary health care institutions would incorporate both statutory- and voluntary-sector institutions, hierarchically arranged around the voluntary general hospitals as regional centres of clinical excellence and specialist expertise.

As we saw in the previous section, such a division of labour was already beginning to emerge, particularly in the provinces, as a result of hospital doctors' efforts to establish private consulting practices. More formal steps to establish a hierarchy of referrals from GPs to institutional care had been taken within the state medical services. By the end of the nineteenth century, the growth of notification schemes

and the establishment of isolation hospitals for various infectious diseases — most notably diphtheria, scarlet fever and tuberculosis — had cast GPs in the role of referring suitable cases for institutional treatment.⁵⁸ This role was extended by such legislation as the Birth Notification Act of 1907 which, in effect, made GPs responsible for referrals to the infant welfare services.⁵⁹ Moreover, following the inception of the National Health Insurance scheme in 1913, the Insurance Commissioners became increasingly concerned that lax certification by GPs was leading to excessive expenditure on sickness benefits and medication. In 1914, plans were drawn up and funds voted by Parliament for the establishment of a system of consultants to whom difficult cases could be referred.⁶⁰ A network of clinics was to be established “where [general] practitioners could attend for consultation with the Specialists”; these clinics would “serve as clearing houses for the selection of cases requiring institutional treatment and as the expert body for controlling ... domiciliary treatment of all kinds”.⁶¹ The outbreak of war prevented these plans being carried out in full, but finally, in 1921, the Ministry of Health established a system of consultant Regional Medical Officers to exercise a “supervisory” function with the aim of maintaining “a satisfactory standard of technical efficiency” among insurance practitioners.⁶²

The development of a system of referrals was also ratified by new notions of preventive medicine. As other historians have noted, from the 1890s the concept of preventive medicine was deployed as a way of reconceptualizing and reconstituting the old environmentally-oriented public health in terms of curative medicine and personal health care services.⁶³ Crucially, however, it also provided a language in which general practice could be redefined as primary health care and located in a nationwide hierarchy of domiciliary and institutional medicine. This notion was developed at length in the first publication of the new Ministry of Health — the extensive memorandum on *The practice of preventive medicine* by George Newman, the Ministry's first Chief Medical Officer.⁶⁴ As a key article of Ministry of Health policy, the conception of preventive medicine thus served to legitimize the reorganization of the health care system and the pursuit of efficiency within the medical services at the same time as it emphasized the importance of maintaining a fit population.

Finally, the creation of a hierarchical division of labour within British medicine was given a new and distinctly managerial slant by the adoption of the concept of “teamwork”. The term was first articulated during the First World War by Robert Jones and other advocates of medical efficiency and a hierarchical division of medical labour, who had been elevated to a leading role in the organization of the military medical services.⁶⁵ They took the opportunity to advance their own ideas of how clinical work should best be organized, and they adopted the notion of teamwork to denote the strictly hierarchical system of medical management that they favoured.⁶⁶ It was to become one of the key medical concepts of the inter-war years. By 1918, as thoroughgoing reconstruction of the peacetime medical services came to seem increasingly likely, the notion of teamwork was adopted by those like Bertrand

Dawson — the main author of the Dawson Report and friend and supporter of Jones and Moynihan — who wanted to encourage a new division of labour within medicine as a whole. For Dawson, teamwork was necessary to correct the inadequacies of “unorganised individual effort, however brilliant”.⁶⁷ His views echoed those of Sir Arthur Newsholme, Principal Medical Officer to the Local Government Board, who insisted during discussions on the proposed Ministry of Health that “There must be more team work between consultant and general practitioner and between nurse and doctor, and economy of effort might be effected by the proper utilization of less skilled persons under fully qualified supervision”.⁶⁸ From the local clinical setting in which it had first been articulated, the notion of teamwork had been appropriated as a resource for criticizing uncoordinated, ostensibly haphazard and inefficient medical arrangements, whether within a single institution or between institutions and services spread over cities, regions, or the country as a whole. It was quintessentially corporatist, repudiating the older style of competitive individualism in medical practice and teaching⁶⁹ in favour of a new hierarchy in which consultant experts would oversee an integrated organization of the parts of medical labour.

Further efforts to promote a hierarchical division of medical labour during the inter-war years were seriously hindered by the prolonged recession and the resulting mood of retrenchment within local and especially central government. The practice of GP referrals became increasingly common during these years, as an unexpected consequence of the fact that the care of patients under the National Health Insurance scheme was paid for on a capitation rather than a fee-for-service basis; GPs working under the scheme now had a strong incentive to pass on their more difficult and time-consuming cases to hospital consultants.⁷⁰ But the efforts of Newman and others at the Ministry of Health to formalize such procedures, particularly by establishing GP clinics, foundered for lack of funds; only a handful of clinics — now known as “health centres” — were set up, chiefly as a result of local initiatives.⁷¹

The Ministry was more successful in pursuing reform in the hospital sector, particularly insofar as it sought to promote closer cooperation between voluntary and state hospitals in the hope of moving towards the creation of a unified hospital system. In 1921, a Ministry of Health committee, established under the Chairmanship of Lord Cave, recommended that state subsidies be provided to the voluntary hospitals, which were in an increasingly desperate financial state. Though the Cave Report was well disposed towards the voluntaries, it strongly urged them to act in a more concerted manner in the interest of efficiency; the alternative, the Report suggested, was state control.⁷² In the provinces many of the voluntaries responded by coordinating admissions procedures and, in the larger cities, by establishing Joint Hospitals Advisory Boards. Government pressure was stepped up in 1929 by the passage of the Local Government Act, which provided for Poor Law infirmaries to be brought under local health authorities. Many of the major voluntary hospitals, fearing that they would be marginalized by improvements in local authority facilities,

now agreed to a measure of collaboration with the state hospitals.⁷³ Further proposals for the integration and coordination of the entire hospital system — put forward with a view to preserving the dominant position of the voluntary general hospitals — were aired by the Sankey Commission of the British Hospitals Association, which sat between 1935 and 1937, and by the Nuffield Provincial Hospitals Trust, established in 1939 to survey hospital provision and suggest plans for regional integration of services.⁷⁴

The powers of the Ministry of Health and other government agencies to intervene in the medical services were greatly enhanced by the threat and ultimately the outbreak of the Second World War. In 1939, the nation's hospital services — voluntary, municipal and Poor Law — were brought under state control with the establishment of the Emergency Hospital (later Medical) Service.⁷⁵ The landslide Labour Party victory in the general election of 1945 effectively provided a mandate for such control to be continued into peace time, and with the creation of the National Health Service (NHS) in 1947, the entire hospital system was nationalized. Efficient management and utilization of medical services was one of the dominant concerns of the architects of the NHS. Thus all kinds of institutional provision were brought together under the control of Regional Hospital Boards, with a view to imposing effective management, coordination and planning on the hitherto disparate institutions. Within the hospital service, the Ministry took steps to establish a formal four-stage hierarchy of junior and senior doctors, ostensibly for training purposes, but also as a means of encouraging teamwork and division of labour among hospital doctors.⁷⁶ Meanwhile, primary health care too was brought under the NHS by extending the National Insurance system of GP care to the entire population; under this arrangement, GPs effectively came to serve as gatekeepers to the specialist services based in the hospitals.

These reforms were not achieved without resistance from doctors, who were anxious to retain at least a measure of private practice. As early as 1918, members of the old consultant élite like Sir Rickman Godlee had looked “askance at the rising tide of state control”, and “hoped there would still remain some little bays and inlets for those who shared his own professional ideals” of individualized private practice.⁷⁷ Godlee may have been scare-mongering, but even those consultants who advocated a measure of rationalization expressed reservations: Bertrand Dawson, for instance, warned that a completely state-run service “would ruin the profession; it would remove the stimulus of rivalry, lead to intellectual stagnation, and medicine would become a machine without a soul”.⁷⁸ Such protests became more heated following the passage of the 1929 Local Government Act, and again in the early 1940s as a national health service came to seem increasingly likely. Above all, doctors objected to proposals that they should be required to work on a purely salaried basis — an arrangement that reformers in the Ministry of Health argued would diminish wasteful competition for patients and encourage teamwork.⁷⁹ GPs instead endorsed the principle of capitation fees as paid under the National Health Insurance scheme, and were eventually brought into the NHS on this basis.⁸⁰

Likewise, hospital consultants successfully resisted proposals that they should rely solely on the state for their employment; though brought into salaried service by the NHS Act of 1946, they were nevertheless allowed to undertake a certain amount of private practice in their spare time. To an extent, these concessions — granted in order to defuse medical opposition to a nationalized health system — tended to undermine attempts to establish a clear-cut managerial hierarchy in the planning and running of NHS services.⁸¹

Nevertheless, the creation of the NHS brought into being a far more comprehensively corporate system of medical management than anything that had previously existed in Britain.⁸² As we saw in the previous section, many of the doctors and managers who worked in the voluntary hospitals themselves favoured moves in the direction of more corporate forms of medical care, but the extent and scope of such developments remained limited so long as the culture of hospital medicine continued to be dominated by the efforts of individual practitioners to secure a competitive advantage at the élite end of the private medical marketplace. By contrast, the growth of state involvement in the provision of medical services — initially under the Poor Law, but subsequently through local authority institutions, National Health Insurance, and state funding for the voluntary hospitals — was driven primarily by a concern to promote national efficiency and competitiveness by providing a system of mass health care. With the creation of the NHS, these values came also to dominate what had previously been the élite voluntary hospitals, while the interests of private doctors were relegated to a distinctly inferior, if still potent, place in the organization of health care. As private health care became a luxury for the rich, relationships between doctors and patients became less personal and increasingly mediated by systematic and managerial forms of work organization: individualized forms of medical practice were to a large extent displaced by teamwork and managerialism in hospital medicine, and by standardization and routinization in general practice.

3. SCIENCE AND THE CHANGING FORMS OF MEDICAL KNOWLEDGE

So far, we have characterized the changes that took place in British medicine between 1870 and 1950 as managerial and organizational transformations, which we have explained as responses to the changing political, social and economic circumstances of health care delivery. Our story has been of a changing political economy of medicine, comprehensible in the conventional terms of social and economic history: we need not have recourse to the influence of new developments in medical science in order to explain these changes. Nevertheless, during this period the laboratory sciences, especially physiology, pathology and biochemistry, came to play an increasingly important role both in the production and dissemination of medical knowledge and in the day-to-day practice of medicine. Not only did these sciences yield innovations in diagnostic and therapeutic technique, but they also provided doctors with new concepts of health and illness with which to understand their

patients. Moreover, disputes over the implications of the new sciences loomed large in debates about how medicine should best be organized and practised. Clearly, if the development of the laboratory sciences did not drive the transformation of medicine, it was nevertheless intimately associated with it. In this section of our paper, we explore the nature of that association, to show just how the laboratory sciences were implicated in the managerial transformation of medicine.

Laboratories first became closely involved in medical practice in the sphere of public health. Nineteenth-century public health was primarily an administrative discipline: it was closely linked with the growth of local and national government, and was concerned with managing the health of populations rather than individuals. This administrative orientation can be discerned in the kind of knowledge that became associated with public health practice during the first half of the century. New theories of epidemic disease developed primarily as technologies of surveillance and classification: by attributing disease, not to the vagaries of individual constitutions, but to specific and universal causes, they made possible a natural history of health and illness which specified the dangerous locations and dangerous classes on which remedial action could be focused.⁸³ In effect, this constituted an administrative way of knowing: the definition of appropriate categories of illness and insalubrity, and the adoption of universal criteria for allocating individuals and localities to those categories, was a necessary precondition for the routine deployment of standard responses to the problems of public health.⁸⁴

The emergence of this new style of cognition did not depend, in the first instance, upon developments in the laboratory sciences; if anything, social statistics, rather than pathology or physiology, was the fundamental science of public health administration during the first three-quarters of the nineteenth century.⁸⁵ By comparison, the laboratory sciences were a relatively late development, at least in Britain; only from about the mid-nineteenth century did professionalizing medical scientists begin to adopt laboratory-based methods of investigation. They did so, however, with the support of public health administrators, who quickly began to perceive ways in which these new methods could be put to use in the pursuit of their own administrative goals.

Proponents of the laboratory sciences argued that their work would lead to a new body of medical knowledge, based not on the narrow empiricism of clinical experience, but on systematic and rational investigation of the underlying causes and processes of health and disease.⁸⁶ Such claims held an obvious interest for public health administrators, who were themselves inclined to suppose that, for administrative purposes, ill health could best be viewed in terms of specific disease categories with specific causes. Consequently, public health activists now began to encourage laboratory-based research into the poisons occurring in air, food and water, and into what came to be regarded as the germs of epidemic illness.⁸⁷ As they anticipated, this research soon yielded new techniques for identifying disease and its causes in the population and the environment. These techniques improved on existing methods of surveillance by narrowing the focus of analysis from unhealthy classes and

dirty regions to infected individuals and specific environmental contaminants. Older methods of prevention, including disinfection and quarantine, could now be deployed with greater economy, while laboratory manipulation of germs and other poisons led eventually to new and increasingly specific preventive measures, including immunization and the treatment of effluents.⁸⁸ By the end of the century, bacteriological and chemical laboratories had come to occupy an honoured place in the armamentarium of public health medicine.

In contrast, laboratories penetrated only slowly into hospital medicine during the nineteenth century. It was not that laboratory scientists were uninterested in the kinds of illness treated by physicians and surgeons; on the contrary, physiologists, in particular, repeatedly claimed that their research into the underlying processes of health and illness had implications for the clinic as much as for public health medicine.⁸⁹ But on the whole, physicians and surgeons were cautious about adopting laboratory-based techniques of diagnosis and investigation, and kept themselves aloof from the scientists who championed such techniques. Thus, although the laboratory sciences became part of the education of all medical students in the course of the nineteenth century, they were relegated to a preparatory role in a separate pre-clinical curriculum, and had only limited impact both on clinical practice on the wards of the teaching hospitals, and on the clinical training that was carried out there. The very different reception of laboratory-based knowledge and techniques by public health officials and hospital practitioners during the nineteenth century is readily explained by the different social relations of practice in the two spheres. Compared with the administrative world of public health, the social relations of elite curative medicine — most notably in private practice, but also in the hospitals, which were so important to the identity of elite practitioners — were highly individualized, as we have seen. The medical knowledge that legitimated this kind of practice was accordingly personalized and individualized. First, it identified successful practice with the possession of an extraordinary level of diagnostic and therapeutic skill and judgement, developed through personal experience of practice itself, and embodied in the individual practitioner.⁹⁰ And second, it conceptualized cases of illness, not in terms of general disease categories, but as unique and idiosyncratic events, each occurrence of which needed to be fathomed and treated in all its complexity by a doctor with wide-ranging knowledge and experience.⁹¹ This way of knowing was well suited to a system of private medical care that emphasized the close personal attention that doctors paid to their individual patients.⁹²

Elite doctors resisted the introduction of new laboratory techniques into their practice for the same reason as they resisted specialization: because they feared that such techniques would tend to undermine the personal and individualized social relations around which they built their highly lucrative private practices. In the first place, laboratory techniques tended to dilute the clinician's personal authority by transferring responsibility for diagnoses to "the bacteriologist, haematologist, chemist or radiographer, for whom [the clinician] became, as it were, the collecting agent".⁹³ Moreover, such techniques tended to reduce diagnosis to a routine procedure of

identifying the particular disease or condition from which the patient suffered; in effect, they privileged the disease over the idiosyncrasies of individual patients. Clinicians denounced this logic of categorization, and reasserted more individualized notions of illness and its diagnosis: "While the information supplied by [the laboratory] was invaluable", cautioned one physician, "... it should be used at the bedside [only] in conjunction with the information obtained by direct observation", lest it be forgotten "that disease was a condition and not an entity".⁹⁴ Such opposition appears to have limited the clinical adoption of new scientific theories and techniques. Suggestive research by Stephen Jacyna indicates that, insofar as histological diagnostic techniques had been introduced into hospital surgery by about 1900, they served chiefly as an accessory rather than an alternative to the surgeon's own clinical judgement. On the whole, laboratory tests might be used to reinforce a clinician's authority, but they could not challenge it.⁹⁵ Were they allowed to do so, they would also challenge the values around which the élite end of the private medical market was structured.

As we noted in the first section of the paper, this individualized system of practice was beginning to come under challenge, by the third quarter of the nineteenth century, as a result of growing pressure for greater efficiency in hospital medicine. To the extent that clinicians were prepared to meet such demands by adopting new working methods, they were also prepared to abandon their individualized understanding of their patients in favour of a more administrative system of categorization. Thus as early as 1868, even an opponent of specialization like Jonathan Hutchinson could extol "the convenience of classification" for dealing efficiently with large numbers of cases in outpatient departments, on the grounds that such classification would permit more accurate "inductions as to the nature of the disease" and hence greater success in treating it.⁹⁶

By the early twentieth century, as we have seen, concerns with efficiency had become linked to calls for a more general reorganization of medical work, as a new breed of clinicians sought to establish a measure of specialization and division of labour, both within hospitals and between general practitioners and hospital consultants. These same clinicians also tended to be better disposed than their more individualistic peers to the claims of the new laboratory sciences. The eminent physician Sir Clifford Allbutt, for example, called for greater attention to the "principles of the laboratory" to complement the "skill and sagacity" that were the hallmarks of a good practitioner.⁹⁷ Crucially, however, Allbutt was careful to portray the laboratory sciences, not as a means of diagnostic categorization, but rather as a means of augmenting the methods available to clinicians for elucidating the peculiarities of individual patients.⁹⁸ Far from undermining the status of hospital doctors, such a construal of laboratory-based knowledge and techniques served rather to reinforce their claims to be regarded as consultants, whose professional role lay in investigating and treating those difficult or obscure cases who fell beyond the more routine competences of general practitioners.⁹⁹

The laboratory sciences thus did not necessarily imply an administrative way of

knowing; depending on the kind of medical practice and the particular configuration of social relations to which they were assimilated, they could just as well be used to support a more individualized understanding of illness.¹⁰⁰ Nevertheless, administrative interests lay behind the introduction of laboratories into increasingly large areas of personal as well as public health practice from the beginning of the twentieth century. This was particularly the case as government initiatives in preventive medicine came to focus, not just on environmental regulation, but also on the provision of GP care to the working-class population. We mentioned in the previous section that, following the inception of the National Health Insurance scheme, a system of consultants was set up to supervise the work of insurance doctors and to advise on the diagnosis and treatment of difficult cases. At the same time, the insurance authorities also approved the establishment of a network of state laboratories as a means of imposing greater uniformity and stringency on sickness certification and treatment.¹⁰¹ In the event, this proposal did not survive the outbreak of the First World War. Only in 1939, when the Second World War renewed the impetus towards centralized state control of medical provision, was an Emergency Public Health Laboratory Service set up to assist GPs in dealing with the expected resurgence of epidemic disease: with the establishment of the NHS, this service was continued as a means of coordinating civilian health care.¹⁰² In this guise, medical laboratories clearly served administrative interests, being used to discipline and standardize general practice with the aim of creating a routinized system of mass medicine.

Concern with the administration of general practice was also apparent in efforts to reform medical education in the years immediately before the outbreak of the First World War. Such reforms had important implications for the organization of hospital medicine, particularly in the teaching hospitals. Medical students acquired the vast majority of their practical training by following the day-to-day work of doctors on the wards of the voluntary teaching hospitals, learning their craft from the practices they observed there and in the more formal classes conducted by the same clinicians. For the doctors in these hospitals, part-time teaching served not just to supplement the income from private practice, but also provided an opportunity to demonstrate the personal skills and acumen on which their claims to pre-eminence within the medical profession were based. Consequently, clinical teaching tended to be organized around the diagnosis and treatment of peculiarly difficult or obscure cases, often presented in a highly theatrical manner by charismatic consultants.¹⁰³ Medical reformers like George Newman were of the opinion that this kind of training was no longer compatible with the needs of the great majority of doctors, or — more importantly — with the interests of the state which was increasingly responsible for funding those doctors.

In part, this was a matter of the kinds of cases the students observed on the hospital wards. Where hospital doctors were chiefly occupied with "disease in its gross and serious form ... the signs of advanced disease of heart or lung or nervous system", Newman held that the prospective GP should be taught to recognize "the

beginnings of disease ... the subjective symptoms ... which bring the patient to his door, the first warnings, the early pain"¹⁰⁴ — to become, in effect, a primary health care practitioner. The new preventive medicine would thus require a more structured and standardized clinical curriculum which concentrated on providing GPs with a basic knowledge of common ailments.

Newman and his colleagues were not just concerned with the substantive content of the existing system of clinical teaching, however. They were also highly critical of the kind of understanding of illness and its treatment that it tended to inculcate in students. This was made clear in the 1913 Report of the Royal Commission on University Education in London. The Commission considered the old method of "clinical instruction on the case of each patient as the physician makes his round of the wards" to be "too *individual* to lift the mind to a comprehensive survey of the subject".¹⁰⁵ Consequently, such methods should be complemented, if not replaced, by formal clinical demonstrations organized around the presentation of more systematic and categorical forms of medical knowledge:

[T]he student comes to the clinical demonstration to hear about the disease, and he will find prepared for clinical demonstration a number of patients, each of whom is not so much interesting in himself as because he exemplifies one particular aspect of the disease.... The case is used as an illustration, and the professor deals with the whole disease which he finds exemplified in the patient.¹⁰⁶

Instead of concentrating on the idiosyncrasies of individual patients, hospital doctors should teach their students to assign cases to particular disease categories; the individualized way of knowing that had previously dominated hospital practice and instruction should now be replaced by more routinized and standardized forms of knowledge that were more in keeping with the administrative demands of state medicine.

The reformers were well aware that their proposals for restructuring clinical teaching were at odds, not just with the form of knowledge that clinicians favoured, but also with the social relations of elite hospital medicine. Consequently, Newman and his colleagues did not just recommend changes in the content and style of the clinical curriculum; they also sought important reforms in the social organization of clinical education. Specifically, they recommended that clinical teaching should be handed over to full-time academics who would be appointed, not by the hospitals, but by university medical faculties, and who would be prepared to commit themselves to full-time research and teaching.¹⁰⁷ Crucially, full-time professorships would sever the connection between clinical teaching and elite private practice: hospital teaching posts would no longer be occupied by doctors who used them to advertise their pre-eminence in the medical market place, but by career academics whose professional advancement depended on their success in teaching and research. This change in the social relations of clinical teaching was expected to have important implications for medical pedagogy. Full-time teachers would be less tempted than their part-time predecessors to promote their own diagnostic and

therapeutic skills by focusing on peculiarly difficult or spectacular cases. Consequently, they would be more willing to teach their students about the common ailments and early stages of disease that Newman and others regarded as the mainstay of general practice and preventive medicine, and to introduce a more administrative way of knowing into the lecture theatre and hospital ward.¹⁰⁸

These calls for the reorganization of clinical teaching were intimately bound up with proposals for a closer integration of the laboratory sciences into hospital practice, and especially into the practical training of prospective doctors. It must be stressed, however, that the proposed reform of the clinical curriculum was neither driven by nor dependent upon new developments in medical science; it need involve no more than a reorganization and reorientation of existing medical knowledge, to be brought about primarily by changes in the social relations of clinical teaching. Conversely, as we have seen, the integration of laboratory-based knowledge and techniques into hospital practice did not imply any necessary change in either the social relations of such practice, or in the individualized style of clinical knowledge that legitimized it; on the contrary, clinicians were perfectly able to assimilate the laboratory sciences to the forms of cognition and practice that they favoured. Consequently, in order to explain the enthusiasm that Newman and others professed for the laboratory sciences, we must look, not to any essential connection between laboratories and an administrative way of knowing, but rather to the contingent ways in which the importation of laboratory science might benefit their campaign for the reform of clinical teaching and medical practice. There were several such benefits.

In the first place, the pre-clinical laboratory sciences were attractive because they already harboured a body of professional full-time academics — the majority of them medically qualified — who had chosen careers in research and teaching in preference to the pursuit of private practice. Moreover, while they had failed to gain more than a subordinate role in the conduct of clinical work in the teaching hospitals, many of these scientists were closely involved in the development of more administrative forms of medical practice. Scientists in the provincial medical schools, in particular, often played an active role in promoting the use of new laboratory-based diagnostic tests in public health medicine — not least because the work of testing could be conducted within the schools themselves, thus generating much-needed funds for the expansion of pre-clinical science facilities more generally.¹⁰⁹ It was thus evident that much of the science conducted by pre-clinical medical faculty members was at least in keeping with, and often directly informed by, administrative interests. In the eyes of reformers like Newman, these scientists were eminently eligible candidates to occupy the proposed full-time clinical chairs, not just because of their repudiation of private practice, but also because they would be likely to favour the inculcation of standardized, routinized and administratively efficient forms of knowledge and practice among prospective GPs.

Furthermore, the laboratory sciences also provided a model of how the work of the hospitals might itself be reorganized in the interests of greater efficiency. It was

common for laboratory scientists from different disciplines to collaborate in research and teaching, bringing together complementary skills and expertise to address different aspects of a particular problem. Reformers hoped that the academicization of clinical teaching and research would help to encourage similar forms of teamwork within hospital medicine: full-time clinical professors, they supposed, would be less inclined to practice as individuals than to act as "members, and controlling and directing members, of a group of men working together for a common end — a group in which the subordinate members are selected with a view to the special knowledge required to aid and supplement that of the leading and directing mind".¹¹⁰ Consequently, if laboratory scientists could be given a more prominent and influential role in the conduct of hospital medicine, they might be expected not only to promote administratively appropriate forms of knowledge, but also to encourage the growth of new and more efficient forms of work organization in hospital practice itself.

Government reformers consequently allied themselves with physiologists and other laboratory scientists in campaigning to establish full-time university professorships in hospital clinical schools throughout the country.¹¹¹ The First World War had a dual impact on this campaign. On the one hand, it effectively delayed efforts to set up full-time chairs in the metropolitan medical schools following the 1913 Report of the Royal Commission on University Education in London. But on the other hand, it did much to win wider official recognition for laboratory scientists' claims to have important contributions to make to the development of clinical medicine. In the course of the War, physiologists and other laboratory scientists were for the first time given routine charge of hospital patients, as the authorities cast around for solutions to the new medical problems precipitated by the War. Significantly, the kinds of solutions these scientists were able to offer were generally deemed successful, not so much in terms of the criteria favoured by more traditional clinicians, who still thought primarily of the good of individual patients, but more in administrative terms. Techniques such as oxygen therapy for the victims of poison gas, or the functional redefinition of conditions such as "soldier's heart", were valued by the War Office primarily because they could be deployed, within the administrative framework of military medicine, as routine and standardized responses to the problems of injury and illness; and because they were seen to reduce the time soldiers spent in hospital before being returned to the front or discharged from military service.¹¹²

Aided by such successes, Newman was able, in the years immediately following the War, to press forward the campaign for full-time clinical professorships, with the result that several such posts were established in the metropolitan hospital medical schools between 1919 and 1921; the majority of them were filled by men who had worked in pre-clinical science departments before the War, but had moved into clinical research under the auspices of the War Office.¹¹³ The provincial medical schools were lower on the government reformers' list of priorities, and no full-time professorships in medicine or surgery were established there in the immediate post-war years.

But as we saw in the case of specialization, the professional ecology of provincial medical practice — particularly the close symbiosis between the teaching hospitals and the so-called “civic” universities — provided a more hospitable environment for conservative innovation than did metropolitan institutions; spurred by the threat of central government intervention, the provincial hospitals took their own steps to integrate pre-clinical scientists more closely into clinical teaching, albeit in ways that tended to preserve the autonomy and authority of the existing class of hospital doctors.¹¹⁴

If such compromises were possible in the provinces, however, relations between academic clinicians in the metropolis were marked by deepening hostility. Increasingly, élite clinicians felt themselves threatened by the reform of clinical teaching, as much as by the government reformers’ more overt attempts to reorganize hospital medicine at that time. Even those like Bertrand Dawson, who had initially supported government proposals to integrate laboratory work into hospital teaching,¹¹⁵ now realized that Newman and his allies intended to displace them from their hallowed position at the top of the medical hierarchy and replace them with salaried clinical scientists; by the early 1930s, they had begun to voice bitter polemics against the kind of clinical knowledge being promoted by academic doctors and their supporters, and to reassert more individualized conceptions of illness and its treatment.¹¹⁶ Government efforts to force through further restructuring of clinical training were hindered by the deepening climate of economic depression and political retrenchment: in the decade that followed the successes of the early 1920s, the pace of reform in medical education, as in the restructuring of medical practice more generally, slowed almost to a halt. Pressure for greater integration of laboratory teaching into the undergraduate clinical curriculum was maintained by the General Medical Council, which continued to stress the importance of laboratory training as a means of orienting GPs towards the practice of preventive as much as curative medicine.¹¹⁷ But such exhortations were to little avail as élite clinicians joined forces to deny academics greater authority within hospital medicine; by the 1930s, a stalemate had been reached.¹¹⁸

Only outside the main centres of élite charitable medicine did full-time scientists make any significant inroads into clinical practice. The first of these was at a relatively small local authority hospital — the Hammersmith, owned by the London County Council — where in 1935 the British (later Royal) Postgraduate Medical School was set up, staffed largely by full-timers appointed by the University of London.¹¹⁹ The following year, Lord Nuffield provided funds for the creation of a number of full-time clinical professorships at the Radcliffe Infirmary in Oxford; again, this was a relatively small hospital which, despite its proximity to the University, had hitherto played only a minor role in medical education, and which now, like the Hammersmith, came to focus on the postgraduate training of would-be consultants.¹²⁰

The outbreak of the Second World War strengthened the hand of government in promoting the reform of clinical teaching as of other aspects of hospital practice.

With the establishment of the Emergency Medical Service in 1939, much of the responsibility for coordinating the work of the hospitals was given to academic doctors recruited from the various full-time clinical professorships that had been created following the previous war.¹²¹ As it began to look increasingly likely that the medical services in their entirety would be nationalized after the war, government reformers also returned to the question of what kind of medical education would best serve to prepare doctors for practice in such a system. In 1944, an Inter-departmental Committee on Medical Schools — dominated by academic clinicians and their supporters — renewed the call for the appointment of full-time clinical professors in all teaching hospitals.¹²² Finally, following the establishment of the NHS and the extension of salaried service to the great majority of doctors in British hospitals, the Committee's recommendations were adopted as policy: with the creation of academic posts throughout the teaching hospital system and the appointment of professors trained in the new discipline of clinical science, clinical education now came under far more extensive academic control than ever before.

As a result of such reforms, elevation to the highest ranks of the medical profession came increasingly to depend upon success in research and teaching. At the same time, the supply of research funding from governmental and charitable bodies and from industrial concerns began to expand at a rapid rate. Clinical research, like other areas of scientific investigation, grew massively in the years that followed the Second World War, leading to an explosion of new knowledge of physiological and pathological processes, and a proliferation of new laboratory-based diagnostic and therapeutic techniques.¹²³ The laboratory sciences and their associated technologies had become central to medical research, teaching and practice.

That is not to say that the importation of laboratory technologies and a research mentality into clinical medicine led inevitably to the kind of administratively-oriented forms of knowledge that reformers had hoped. As we saw in Section 2, the creation of a thoroughly corporate system of medical practice was somewhat compromised when the government backed off from imposing entirely salaried service on either GPs or consultants. Equally, we have argued that laboratory-led innovations in medical knowledge and practice did not necessarily imply an administrative way of knowing. Consequently, it should be no surprise that, in some ways at least, the academicization of clinical medicine did rather less to inculcate a thoroughly administrative spirit into the medical system as a whole than many reformers had hoped. Most notably, it failed to bring about the standardization of general practice that had initially been expected of it. Rather than devote their energies to teaching the diagnosis and treatment of common ailments, the new academic clinicians tended to concentrate on the kinds of knowledge and skills most closely associated with their own élite hospital practice. Consequently, separate postgraduate training schemes for GPs had subsequently to be set up.¹²⁴

Nevertheless, the overall effect of the academicization of clinical medicine and the expansion of clinical research, within the new organizational structures of the NHS, was to encourage the growth of more administratively inflected forms of

medical knowledge and practice throughout the system. As a class, the new breed of consultants were less concerned than their predecessors to be seen as individual medical virtuosi, and more inclined to identify themselves with the most technically sophisticated and specialized forms of diagnosis and treatment. Consequently, they were more disposed to rely upon new laboratory-based techniques of diagnosis and treatment, not just in their research, but also in their routine practice. This was evident in their support for the establishment of a comprehensive clinical pathology service under the NHS; the administrative origins and aims of this service are apparent in the fact that it was closely linked to the Public Health Laboratory Service and based, not in the old voluntary teaching hospitals, but rather in those hospitals that had previously been under local government control.¹²⁵

Moreover, while consultants were primarily interested in hospital practice, the products of their research tended to trickle down to GPs in ways that contributed greatly to the routinization and standardization of general practice. In particular, consultants were keen to involve themselves in the development of new methodologies for evaluating the effectiveness of experimental therapies. With their help, statistical methods of conducting clinical trials, first employed on a large scale during the Second World War, quickly came to be accepted as the best means of assessing new drugs before they were made generally available to doctors. Clinical trials embodied a quintessentially administrative approach to the formulation of medical knowledge. Developed with the express intention of eliminating any vestiges of personalized judgement from the assessment of the effects of drugs, they were centrally administered and coordinated for the purpose of generating standardized knowledge of the treatment of specific disease entities.¹²⁶ Such knowledge proved highly effective as a means of controlling the proliferation of new drugs that followed the Second World War, and of regulating and routinizing the work of GPs in particular.¹²⁷

In general, then, the academicization of leading sectors of hospital medicine, and the introduction of laboratories and other scientific investigative techniques into clinical research, teaching and practice, did much to favour the growth of an administrative as opposed to an individualized way of knowing in medicine. This way of knowing was well suited to the demands of administering a corporate system of mass health care organized around a hierarchical division of medical labour. Shaped by the need to regulate and standardize diagnostic and therapeutic practice, it was closely linked to the pursuit of efficiency both in hospital medicine and in the health care system as a whole. In particular, it was a vital element in the increasing routinization of large areas of general practice. Laboratory-based methods of investigation occupied a special place in this administrative way of knowing. Along with other new scientific techniques, most notably clinical trials, they developed primarily as a means of generating standardized knowledge of ill health and its treatment. It was this administrative function, above all, that ensured the ascendancy of laboratory science as one of the chief sources and arbiters of medical knowledge in post-war Britain.

CONCLUSION

Clearly, a major transformation took place in British medicine between about 1870 and 1950. At the heart of this transformation was an over-riding concern with efficiency, which developed in a variety of sites and out of a diversity of interests: in agencies organizing medical charity, in outpatient clinics, in hospital boardrooms, in individual consulting rooms, and in local and central government offices. Increasingly, however, these diverse sites and interests were subordinated to wider preoccupations with what one commentator called the "essential function of the whole community".¹²⁸ The programme of medicine was changing to serve emerging corporate and national interests that demanded the creation of an increasingly unified system of mass health care incorporating hospitals, general practitioners and the public health services. These changes involved a fundamental shift in the social relations of medicine. The close personal relationships and lay patronage that had dominated both private practice and medical philanthropy gave way to more exclusively professional management of patients and institutions.

These new social relations were in turn mediated by a new way of knowing. The division of medical labour, the routinization of many medical tasks, and the practice of intra-professional referrals and supervision, were reflected in and facilitated by a new and systematic distribution of knowledge among medical practitioners, and by an increasingly depersonalized understanding of the phenomena of health and illness. Science, and especially the laboratory sciences, developed in ways that were consonant with this administrative way of knowing. Medical laboratories were adopted as an authoritative source both of systematic knowledge of vital and pathological phenomena, and of techniques for categorizing illness which could readily be adapted to the work of medical management. As such, the laboratory sciences proved to be highly effective instruments of corporate culture: practically and epistemologically, the new sciences served to displace the logic of individual experience and judgement that had underpinned the practices and social relations of private and especially elite medicine.

Medical laboratories did not necessarily imply an administrative style of cognition, however. That they turned out to be peculiarly well suited to the work of administration, particularly as instruments of categorization and standardization, cannot be denied. But it was not inherent in the nature of laboratories themselves that they should have developed in this way. On the contrary, as we have been at pains to show, medical laboratories could also be used to pursue a more individualized understanding of the patient and of clinical skill. Consequently, the fact that the laboratory sciences developed overwhelmingly as a means of generating and applying administrative forms of knowledge must be understood as a contingent outcome of the particular series of historical developments we have outlined above. From their early involvement in the work of public health administration to their eventual introduction into hospitals and their role in the work of GPs under the NHS, medical laboratories were developed chiefly to serve the managerial and corporate interests

that by 1950 had come to dominate British medicine.

In developing this argument, we have dwelt chiefly on the wider social, political and economic factors that informed and favoured the growth of the laboratory sciences. It is worth observing, however, that laboratory scientists themselves seem to have shared a preoccupation with managerial and administrative issues, which can be discerned in the kinds of research they conducted and the theoretical concepts they brought to their work. A number of historians have shown that experimental physiology, in particular, was pervaded by managerial and administrative concerns from as early as the first half of the nineteenth century: notions of the physiological division of labour, the adaptation of organs and organisms to their biological functions, and the regulation and coordination of the disparate parts of an organism, all developed in a resonantly metaphorical dialogue with contemporary social theory.¹²⁹ By the end of the century, physiologists in both Europe and America were claiming that their investigative methods and theoretical findings could be put directly to use in the analysis and management of industrial labour. It is in this field of work that laboratory scientists became most closely involved with the kinds of techniques that are usually regarded as constituting scientific management.¹³⁰

Physiologists' interest in industry was not confined to the local application of specific managerial techniques, however. Rather, they argued that their knowledge of the human body enabled them to adopt a much broader view of how industrial society as a whole might best be organized and administered. In 1921, for instance, members of the recently appointed Industrial Fatigue Research Board commented that "[T]he word 'efficiency' is not to be interpreted as equivalent merely to productive efficiency, but as the physiological quality which results from favourable conditions of work. The word is in fact almost equivalent to 'fitness'."¹³¹ By thus equating industrial efficiency with health and fitness more generally, physiologists were able to claim that their work also addressed larger questions about the aims and orientation of government health policy. At a time when medicine and its institutions were being reoriented around a deliberate concern to maintain and manage a fit and efficient industrial population, physiology and other medical sciences offered a functional understanding of health and illness which both legitimized such a reorientation and provided a technical basis for establishing standards of public provision.¹³² Laboratory scientists also played an increasingly important role in the administration of such policies, particularly through their growing involvement in clinical education and in the administration of public health and hospital medicine. The managerial interests that had informed the development of experimental physiology for almost a century thus found expression in what was, in effect, a system of scientific management that ramified throughout industrial society.

In this respect, it should be borne in mind that the advocates of Taylorite scientific management in North America were at least as successful in promoting their ideas in the sphere of social administration as within what is conventionally regarded as the industrial workplace.¹³³ Indeed, Taylor himself was anxious that scientific management should not be regarded as simply a collection of specifically

managerial techniques or methods. "Scientific Management ... is not any of the devices which the average man calls to mind when it is spoken of", he declared; it is nothing more nor less than "[t]he substitution of exact scientific investigation and knowledge for the old individual judgement or opinion ... in all matters relating to the work done".¹³⁴ We have shown how just such a substitution — of an administrative for an individualized way of knowing — was pursued as a means of promoting efficiency within the emerging system of corporate medical provision. Moreover, we have made clear that many of those who encouraged the incorporation of the laboratory-based medical sciences into medical practice did so precisely because they saw those sciences as serving administrative interests. There thus existed a far more intimate historical relationship between the growth of management and the advancement of science than has generally been acknowledged. Contrary to the view usually adopted by historians of medicine and of industry, we need to recognise that, in this instance at least, laboratory science actually developed as an instrument of scientific management. This confluence of science and management lay at the heart of the transformation in British medicine. The world of medicine was remade, not because of science, but through a logic of efficiency that science could be mobilized to confirm.

It remains to be seen whether a similar view of scientific development can be adduced for contexts other than the peculiar configuration of philanthropic, private and state medicine that emerged in late nineteenth- and early twentieth-century Britain. We would suggest, however, that our general conclusions might equally well apply elsewhere. America, for instance, followed a different but in many ways parallel path towards medical corporatism, and we would expect that the promotion of the laboratory sciences can be located in this broader movement much as we locate it in the British setting. We hope that other historians will endeavour to confirm or confute this expectation. Equally, medicine was only one among a number of spheres of activity in which corporatism and something called scientific management went hand in hand. We might suppose, therefore, that similar connections between the growth of management and the advancement of the laboratory sciences might be identified in these spheres. Again, it is for other historians to assess this supposition.

Whether or not our ideas about administrative knowledge and scientific management prove to be salient for other contexts, however, we would suggest that, at the very least, our analysis of the case of British medicine serves to exemplify one methodological principle of more general relevance. In keeping with the views expressed by other historians, we have shown that new forms of science did indeed become dominant in medicine primarily because of the cultural values and ideals that they were seen to embody. But those values did not reside simply in some abstract rhetorical appeal to popular sentiment. Rather, they were to be found in the specific technical and intellectual ends that science was understood to serve. Technical values, in other words, must themselves be understood as a form of cultural value. It is only by showing how particular kinds of technique came to be valued —

a task that entails understanding the particular cultures within which they were so valued — that we can hope to explain how science has come to play a leading role in modern society.

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1. John Harley Warner, "The history of science and the sciences of medicine", *Osiris*, x (1995), 164–93, p. 178.
2. The most prominent of these are: Judith Walzer Leavitt, *Brought to bed: Childbearing in America, 1750–1950* (New York, 1986); Charles E. Rosenberg, *The care of strangers: The rise of America's hospital system* (New York, 1987); Gerald L. Geison, "'Divided we stand': Physiologists and clinicians in the American context", in Morris J. Vogel and Charles E. Rosenberg (eds), *The therapeutic revolution: Essays in the social history of American medicine* (Philadelphia, 1979), 67–90; S. E. D. Shortt, "Physicians, science, and status: Issues in the professionalization of Anglo-American medicine in the nineteenth century", *Medical history*, xxvii (1983), 51–68; Paul Starr, *The social transformation of American medicine* (New York, 1982); Rima D. Apple, *Mothers and medicine: A social history of infant feeding, 1890–1950* (Madison, 1987). Since Warner's article appeared, Joel Howell has offered a similar account of the adoption of new laboratory technologies in American hospitals: Joel D. Howell, *Technology in the hospital: Transforming patient care in the early twentieth century* (Baltimore, 1995).
3. Warner, "The history of science and the sciences of medicine", 179.
4. *Ibid.*, 176–7.
5. *Ibid.*, 180.
6. *Ibid.*, 181.
7. *Ibid.*, 182.
8. Historians have used the notion of a corporate culture in a number of different but related ways. Historians of business and industry identify it with the system of large, vertically integrated corporations that developed through the merger of smaller competing firms from the late nineteenth century, and that evolved hierarchical managerial structures in order to realize the

economies of scale that such mergers made possible: Leslie Hannah, *The rise of the corporate economy* (London, 1976). Others, perhaps with an eye towards the specific politics of "corporatism" that was pursued in Fascist Italy, have taken state intervention to be a key element in corporate industrial organization. Keith Middlemass, for instance, argues that twentieth-century British industrial politics exhibited a deepening "corporate bias" towards a triangular system of collaboration between state, labour and capital, enacted across whole industries with the purpose of minimizing class conflict and maximizing collective productivity: *Politics in industrial society: The experience of the British system since 1911* (London, 1979). Harold Perkin builds on this perspective when he identifies the growth of the welfare state as a form of corporate management of society as a whole: *The rise of professional society: England since 1880* (London, 1989), chap. 7: "Towards a corporate society". As will be seen, our analysis of the development of corporatism in British medicine will draw, at different points, on both these approaches. Cf. Stephen J. Kunitz, who discusses efforts to establish a similarly "corporate" system of medicine in America, in his "Efficiency and reform in the financing and organization of American medicine in the Progressive Era", *Bulletin of the history of medicine*, lv (1981), 497-515, p. 501. On historical and current articulations of "corporatism" as a political doctrine, see Peter J. Williamson, *Varieties of corporatism: A conceptual discussion* (Cambridge, 1985).

9. The claim that the growth of medical knowledge demanded a new division of medical labour was first articulated by late nineteenth- and early twentieth-century proponents of specialization. Such views tended to be reiterated by historians of medicine at least up to the 1960s. Erwin Ackerknecht, for instance, states that "the great increase in scientific knowledge during the nineteenth century for the first time made it possible, and even necessary, for medical men to limit their practice to the diseases of certain organs or organ groups": Erwin H. Ackerknecht, *A short history of medicine*, rev. edn (Baltimore, Md, 1982; orig. pub. 1955), 194. Likewise, Rosemary Stevens argues that "vast and sudden strides in medical research ... compelled a rapid growth of specialization": Rosemary Stevens, *Medical practice in modern England: The impact of specialization and state medicine* (New Haven, 1966), 11. George Rosen places greater emphasis on the importance of social conditions, notably the emergence of a mass market for medical care, in permitting and encouraging a division of labour between practitioners, but he continues to stress that medical specialization was contingent on the growth and subdivision of medical science and technology: George Rosen, *The specialization of medicine with particular reference to ophthalmology* (New York, 1944).
10. See especially Christopher Lawrence, "Moderns and ancients: The 'new cardiology' in Britain 1880-1930", and Joel D. Howell, "'Soldier's heart': The redefinition of heart disease and specialty formation in early twentieth-century Great Britain", both in *Medical history*, Supplement no. 5 (1985), 1-33 and 34-52 respectively.
11. For instance, Daniel Fox has suggested that the growth of the laboratory sciences was one of the driving forces behind the creation of regional hierarchies of primary and secondary health care institutions in both Britain and the United States during the twentieth century. Daniel M. Fox, *Health policies, health politics: The British and American experience 1911-1965* (Princeton, 1986).
12. See: *Efficiency, scientific management, and hospital standardization: An anthology of sources*, ed. with an introduction by Edward T. Morman (New York, 1989); George Rosen, "The efficiency criterion in medical care, 1900-1920: An early approach to an evaluation of health services", *Bulletin of the history of medicine*, l (1976), 28-44; Susan Reverby, "Stealing the golden eggs: Ernest Amory Codman and the science and management of medicine", *Bulletin of the history of medicine*, lv (1981), 156-71; Morris J. Vogel, "Managing medicine: Creating a profession of hospital administration in the United States, 1895-1915", in Lindsay Granshaw

- and Roy Porter (eds), *The hospital in history* (London, 1990), 243–60; Howell, *Technology in the hospital* (ref. 2), 33–42.
13. A partial exception is Richard E. Brown, *Rockefeller medicine men: Medicine and capitalism in America* (Berkeley, 1979). Brown attributes the promotion of laboratory-based medical science chiefly to the interests of corporate industry and corporate philanthropy, and points to similarities between the conceptualization of the labour process in corporate capitalism on the one hand, and emerging physiological and pathological accounts of the living body on the other. But in seeking to explain quite how these new sciences actually furthered corporate interests, he is forced, like other historians, to resort to an account of the ideological rather than the direct practical benefits they yielded.
 14. Thus, for instance, Harry Braverman: "Scientific management, so-called, is an attempt to apply the methods of science to the increasingly complex problems of the control of labor in rapidly growing capitalist enterprises. It lacks the characteristics of a true science.... It enters the workplace not as a representative of science, but as the representative of management masquerading in the trappings of science." Braverman, *Labor and monopoly capital: The degradation of work in the twentieth century* (New York, 1975), 86. For hints towards the archaeology of a more instrumental relationship between science and management, see R. M. Young, "Scientism in the history of management theory", *Science as culture*, viii (1990), 118–43.
 15. Charles Rosenberg notes the rise of a language of efficiency in American hospitals at much the same time, and points in particular to the multiplicity of meanings and resonances — technical, financial, and moral — that attached to the word: "Inward vision and outward glance: The shaping of the American hospital, 1880–1914", *Bulletin of the history of medicine*, liii (1979), 346–91, pp. 380–2. As will be seen from what follows, the situation was much the same in the British context.
 16. Donna Andrew, *Philanthropy and police: London charity in the eighteenth century* (Princeton, NJ, 1989); Roy Porter, "The gift relation: Philanthropy and provincial hospitals in eighteenth-century England", in Granshaw and Porter (eds), *The hospital in history* (ref. 12), 149–78; Kathleen Wilson, "Urban culture and political activism in Hanoverian England: The example of voluntary hospitals", in Eckhart Hellmuth (ed.), *The transformation of political culture: England and Germany in the late eighteenth century* (London, 1990), 165–84; Brian Abel-Smith, *The hospitals, 1800–1948: A study in social administration in England and Wales* (London, 1964), chap. 1. Some of the London hospitals had medieval origins, but their function changed significantly from the late eighteenth century onwards. For a more general discussion of the ideology of philanthropy in this period, see R. J. Morris, "Voluntary societies and British urban elites, 1780–1850: An analysis", *Historical journal*, xxvi (1983), 95–118.
 17. Charles Rosenberg, "Florence Nightingale on contagion: The hospital as moral universe", in Rosenberg (ed.), *Healing and history: Essays for George Rosen* (Folkestone, 1979), 116–36; Christopher Maggs, *The origins of general nursing* (London, 1983), 102–9; Mitchell Dean and Gail Bolton, "The administration of poverty and the development of nursing practice in nineteenth-century England", in Celia Davies (ed.), *Rewriting nursing history* (London, 1980), 76–101. For a useful comparison with America see Susan M. Reverby, *Ordered to care: The dilemma of American nursing, 1850–1945* (Cambridge, 1987), esp. pp. 143–58. On hospital architecture, see Adrian Forty, "The modern hospital in England and France: The social and medical uses of architecture", in Anthony D. King (ed.), *Buildings and society: Essays on the social development of the built environment* (London, 1980), 61–93; Jeremy Taylor, *Hospital and asylum architecture in England, 1840–1914: Building for health care* (London, 1991).
 18. See Irvine Loudon, "Historical importance of outpatients", *British medical journal*, 15 April 1978, 974–7; Abel-Smith, *The hospitals* (ref. 16), 153ff. The appointment of almoners was

- championed especially by the Charity Organization society from its establishment in 1869. See Charity Organization Society, *Report of the sub-committee appointed to consider the means by which the abuses of the out-patient department of general hospitals may best be remedied* (London, 1870); also *Out-patient reform: Letter to the 'Times' and speech by Sir William Gull, Bart., at the meeting of the Charity Organization Society* (London, 1878). Gareth Stedman Jones identifies the Society as an attempt by the new professional élite to achieve a wider cultural and administrative legitimacy: *Outcast London: A study in the relationship between classes in Victorian society* (Harmondsworth, 1984), 268–70. On the principles guiding the Society's work, see Jane Lewis, *The voluntary sector, the state and social work in Britain: The Charity Organisation Society/Family Welfare Association since 1869* (Aldershot, 1995); Robert Humphreys, *Sin, organized charity and the Poor Law in Victorian England* (Basingstoke, 1995).
19. See, *inter alia*, Roger Cooter and John Pickstone, "From dispensary to hospital: Medicine, community and workplace in Ancoats, 1828–1948", *Manchester region history review*, vii (1993), 73–84; Jo Manton, *Sister Dora: The life of Dorothy Pattison* (London, 1971) for the hospital at Walsall; and Lindsay Granshaw, *St Mark's Hospital, London: A social history of a specialist hospital* (London, 1985), 69 *et passim*.
 20. Archetypical was Henry Burdett (1847–1920), who combined a career in hospital management with one in banking, the Stock Exchange and corporate finance. For biographical information, see Geoffrey Rivett, "Biographical notes on Sir Henry Burdett, 1847–1920", in his *The development of the London hospital system, 1823–1982* (London, 1986), 373–4; Christopher Maggs, *A century of change: The story of the Royal National Pension Fund for Nurses* (London, 1988), of which Burdett was the founder. Another such was Sydney Holland, later Viscount Knutsford, who moved, in the 1890s, from reforming the management of the London docks to running the Poplar Accident Hospital and later the London Hospital: John Gore, *Sydney Holland, Lord Knutsford: A memoir* (London, 1931).
The best account of the emergence of a class of professional managers distinct from the owners of industry is still to be found in Sidney Pollard, *The genesis of modern management: A study of the industrial revolution in Great Britain* (London, 1965).
 21. See, for example, Henry Burdett, *The uniform system of accounts, audit, and tenders for hospitals and institutions*, 4th edn (London, 1916); and, more generally, Burdett, *Hospitals and asylums of the world: Their origin, history, construction, administration, management, and legislation*, iii; *Hospitals — history and administration* (London, 1893).
 22. Frank Prochaska, *Philanthropy and the hospitals of London: The King's Fund, 1897–1990* (Oxford, 1992), 70. Both Burdett and Holland (see above, ref. 20) were closely involved in the establishment and direction of this body.
 23. See Henry Burdett, *Hospital Sunday and Hospital Saturday: Their origin, progress, and development* (London, 1884), 13–16.
 24. Abel-Smith, *The hospitals* (ref. 16), 135. The King's Fund and the charitable Hospital Sunday Fund likewise distributed funds on grounds of efficiency. See Keir Waddington, "Bastard benevolence: Centralisation, voluntarism and the Sunday Fund, 1873–1898", *London journal*, xix (1995), 151–67.
 25. Lawson Tait, "Address in surgery", *British medical journal*, 4 October 1890, 271.
 26. The origins of this term in hospital medicine are obscure. It only appears to come into use around the 1890s, although historians have occasionally used it to refer to the much-criticized system of nepotism that dominated surgical practice and teaching in the early nineteenth century. The 1989 edn of the *Oxford English dictionary* traces the earliest reference to this kind of "firm" to an article in the *Westminster gazette* of 16 August 1909. T. B. Layton's biography of Arbuthnot Lane (1856–1943), consultant surgeon to Guy's Hospital, includes a photograph entitled "The

'Lane Firm,' 1896" showing eight men in surgical garb: *Sir William Arbuthnot Lane: An enquiry into the mind and influence of a surgeon* (Edinburgh, 1956), 80. Geoffrey Keynes, writing on his medical training at St Bartholomew's Hospital in 1910–11, speaks of becoming "attached to a surgical 'firm', that is, working in a group of about eight students under one of the Senior Surgeons": *The gates of memory* (Oxford, 1983), 108; and Richard Lovell documents the existence of surgical and medical "firms" at St Mary's Hospital in the years before the First World War: *Churchill's doctor: A biography of Lord Moran* (London, 1992), 10–11. The use of inverted commas suggests the term's novelty. One source from which it might have been appropriated is William Morris & Co., established in 1861 and widely known simply as "The Firm". Morris's promotional material argued that the replacement of "crude and fragmentary" production methods with co-operative work, "executed in a business-like manner", made it possible to maintain aesthetic standards while reducing costs: J. W. Mackail, *The life of William Morris* (London, 1899), i, 150–2. As a gentleman actively engaged in handcraft production, Morris challenged "accepted social patterns", in ways that resonated with the aspirations of "the new artistic middle class" — including upwardly mobile surgeons — in whose homes Morris furnishings and decorations were practically *de rigueur*. Fiona MacCarthy, *William Morris: A life for our time* (London, 1994), 175, 412–15. In his "Address on Surgery" (ref. 25, pp. 268, 271), Lawson Tait twice invoked Morris's name as a champion of "handicrafts", among which Tait numbered surgery.

27. Charles Macalister, *The origin and history of the Liverpool Royal Southern Hospital with personal reminiscences* (Liverpool, 1936), 61–62.
28. See Roger Cooter, *Surgery and society in peace and war: Orthopaedics and the organization of modern medicine, 1880–1948* (London, 1993), chap. 3.
29. Indeed, as late as the 1880s, general practitioners complained that they were reluctant to refer cases to consultants for expert advice, for fear that the consultants would simply absorb those patients into their own general practices. M. Jeanne Peterson, *The medical profession in mid-Victorian London* (Berkeley, 1978), 227–31, 272–3; Stevens, *Medical practice in modern England* (ref. 9), 31–34; Anne Digby, *Making a medical living: Doctors and patients in the English market for medicine, 1720–1911* (Cambridge, 1994), 32–35.
30. See Lindsay Granshaw, "'Fame and fortune by means of bricks and mortar': The medical profession and specialist hospitals in Britain, 1800–1948", in Granshaw and Porter (eds), *The hospital in history* (ref. 12), 199–220.
31. Cooter, *Surgery and society* (ref. 28), 46–47.
32. Humphry Davy Rolleston, *The Right Honourable Sir Thomas Clifford Allbutt: A memoir* (London, 1929); Alex Mair, *Sir James Mackenzie, M.D., 1853–1925: General practitioner* (Edinburgh, 1973).
33. Quoting from A. G. Y[ates], "Great teachers of surgery in the past: Sir Ernest Finch (1884–1960)", *British journal of surgery*, lii (1965), 81–84, p. 83. Lawson Tait stated, in his 1890 "Address on surgery" (ref. 25), that "The surgeons to our large hospitals are becoming much more of the special consulting and operating surgeons, and less of the senior general practitioners than they used to be" (p. 271). The dynamics of the emergence of consulting practice in one provincial city are explored in Steve Sturdy, "The political economy of scientific medicine: Science, education and the transformation of medical practice in Sheffield, 1890–1922", *Medical history*, xxvi (1992), 125–59.
34. One of the best known was Thomas Horder, whose private practice was built around what his biographer eulogised as "patient-friendships" with politicians, businessmen, actors and artists: Mervyn Horder, *The little genius: A memoir of the first Lord Horder* (London, 1966), 78 *et passim*. Consulting practice and the pursuit of philanthropy went hand-in-hand in the work of Charles McMoran Wilson, physician and Dean of St Mary's Hospital Medical School; Wilson's

- duties as Dean precluded a large private practice, but he compensated by specializing in very rich patients, whom he also tapped for funds for the School. He is best remembered as Winston Churchill's personal physician during the Second World War. Lovell, *Churchill's doctor* (ref. 26), *passim*.
35. William Mayo, "Present-day surgery in England and Scotland: From notes made on a recent short visit", reprinted from *Journal of the Minnesota State Medical Association*, 1 December 1907, 6.
 36. Granshaw, "'Fame and fortune'" (ref. 30), 214–15. But see also David Cantor, "The contradictions of specialization: Rheumatism and the decline of the spa in inter-war Britain", *Medical history*, Supplement no. 10 (1990), 127–44.
 37. This rhetoric was voiced from the 1860s, even by those who themselves benefited from a measure of specialization. Thus, for instance, Jonathan Hutchinson, surgeon to the London Hospital and to the Royal London Ophthalmic Hospital: "I do not advocate 'specialities' ... even in connexion with general hospitals, and no one will admit more firmly than I do that medical science is one and indivisible, and ought on no account to be cut up into segments." Jonathan Hutchinson, "On the best mode of conducting special departments at general hospitals", *British medical journal*, 25 April 1868, 413–14. By 1900, Allbutt was invoking the model of military coordination to argue that, while "Specialism is necessary to scientific advancement, ... specialists to be of service must be, not a separate caste, but scouts in continual touch with the main army". Clifford Allbutt, "Abstractions and facts in medicine", abstract in *British medical journal*, 6 October 1900, 990–1, p. 991.
 38. Proposals for affiliation were included in the *Report of the Select Committee of the House of Lords on Metropolitan Hospitals* (1892), and subsequently adopted by the King's Fund. The Sankey Commission, appointed by the British Hospitals Association to consider reorganization of the voluntary hospital system, made similar recommendations in 1937. Rivett, *The London hospital system* (ref. 20), 140, 163, 216; Prochaska, *Philanthropy and the hospitals of London* (ref. 22), 68–69.
 39. Stevens, *Medical practice in modern England* (ref. 9), 28–29. Cf., for America, Rosenberg, *The care of strangers* (ref. 2), 172–4. The tension between efficiency and generalism is evident in Jonathan Hutchinson's 1868 proposals for the establishment of specialized out-patient clinics in general hospitals. Hutchinson recommended that such departments should be staffed by all the hospital doctors in rotation; thus, while medical tasks would become increasingly specialized, the doctors would remain generalists: Hutchinson, "On the best mode of conducting special departments" (ref. 37).
 40. This is a preliminary finding of what we hope will be a systematic analysis of clinical records in late nineteenth- and early twentieth-century Edinburgh, being conducted by Michael Barfoot, Christopher Lawrence and Steve Sturdy. Cf., on America, S. J. Reiser, "Creating form out of mass: The development of the medical record", in Everett Mendelsohn (ed.), *Transformation and tradition in the sciences: Essays in honor of I. Bernard Cohen* (New York, 1984), 301–16; David Rosner, *A once charitable enterprise: Hospitals and health care in Brooklyn and New York, 1885–1915* (New York, 1982), 55 *et passim*; and Howell, *Technology in the hospital* (ref. 2), 42–56. Again, such measures were particularly important in contexts such as outpatient clinics, where there was no place for intimate doctor–patient relations, and where routine tasks were delegated to several assistants. See also David Armstrong, "Space and time in British general practice", in Margaret Lock and Deborah Gordon (eds), *Biomedicine examined* (Dordrecht, 1988), 207–25; and Barbara L. Craig, "The role of records and of record-keeping in the development of the modern hospital in London, England, and Ontario, Canada, c. 1890–1940", *Bulletin of the history of medicine*, lxxv (1991), 376–97.
 41. Hannah, *The rise of the corporate economy* (ref. 8).

42. On the principles and practices of the New Poor Law see, *inter alia*: Anne Digby, *The Poor Law in nineteenth-century England and Wales* (London, 1982); Karel Williams, *From pauperism to poverty* (London, 1981); Gertrude Himmelfarb, *The idea of poverty: England in the early industrial age* (London, 1984), chap. 6: "The New Poor Law: Pauper versus poor".
43. S. E. Finer, *The life and times of Sir Edwin Chadwick* (London, 1952), 93.
44. Ruth Hodgkinson, *The origins of the National Health Service: The medical services of the New Poor Law, 1834-1871* (London, 1967), chaps. 2 and 3.
45. Infirmarys were built by the Withington Guardians in Manchester in 1862, and in Preston in 1867; the movement became national following the passage of the Metropolitan Poor Law Amendment Act of 1867, and the Poor Law Amendment Act of 1868. See John V. Pickstone, *Medicine and industrial society: A history of hospital development in Manchester and its region, 1752-1946* (Manchester, 1985), 122-7; Hodgkinson, *Medical services of the New Poor Law* (ref. 44), chap. 14; Abel-Smith, *The hospitals* (ref. 16), chap. 6: "The creation of pauper hospitals". For the political background to the passage of this legislation, see James E. O'Neill, "Finding a policy for the sick poor", *Victorian studies*, vii (1963-64), 265-84.
 The development of Poor Law hospitals as a technology of moral as much as medical management ran parallel to — indeed, in some cases slightly preceded — similar shifts in the organization of the voluntary hospitals. On the use of architecture for the purpose of classifying the inmates of Poor Law hospitals, see Williams, *From pauperism to poverty* (ref. 42), 107-28. Such transformations were facilitated by the fact that paupers were commonly regarded as a distinct class of moral incompetents, who could legitimately be subjected to forms of management that were not so readily acceptable in the culture of personal patronage that still pervaded the voluntary hospitals. For the earlier adoption of similarly impersonal forms of medical and moral management in the Navy and in prisons, see Christopher Lawrence, "Disciplining disease: Scurvy, the navy, and imperial expansion, 1750-1825", in David Philip Miller and Peter Hanns Reill (eds), *Visions of empire: Voyages, botany, and representations of nature* (Cambridge, 1996), 80-106; and Michael Ignatieff, *A just measure of pain: The penitentiary in the industrial revolution, 1750-1850* (London, 1978).
46. Edwin Chadwick was one of the most influential proponents of the view that illness was a cause of destitution. Chadwick deployed this claim primarily to press for new sanitary measures, and to argue against the provision of non-deterrent relief to the sick poor: see Christopher Hamlin, "Edwin Chadwick, 'mutton medicine,' and the fever question", *Bulletin of the history of medicine*, lxx (1996), 233-65; Anne F. La Berge, "Edwin Chadwick and the French connection", *Bulletin of the history of medicine*, lxxii (1988), 23-41. However, the same claim was used by medical men to argue for improvements in medical provision under the Poor Law. From the 1870s, in particular, the Poor Law Medical Officers' Association argued that the cost of public assistance was reduced "wherever medical relief to the poor was efficient": Ruth Richardson and Brian Hurwitz, "Joseph Rogers and the reform of workhouse medicine", *British medical journal*, 16 December 1989, 1507-10, p. 1509.
47. Brian Rodgers, "The Medical Relief (Disqualification Removal) Act 1885: A storm in a political teacup", *Parliamentary affairs*, ix (1955-56), 188-94.
48. Royal Commission on the Poor Laws and Relief of Distress, *Minority Report* (London, 1909), 197-8; Abel-Smith, *The hospitals* (ref. 16), chap. 6.
49. The literature on the growth of public health administration in this period is enormous. For the story of local government initiatives, the best overview is Derek Fraser, *Power and authority in the Victorian city* (Oxford, 1979). Developments in central government are covered in Royston Lambert, *Sir John Simon, 1816-1904, and English social administration* (London, 1963); Christine Bellamy, *Administering central-local relations, 1871-1919: The Local Government Board in its fiscal and cultural context* (Manchester, 1988); Jeanne L. Brand,

- Doctors and the state: The British medical profession and government action in public health, 1870-1912* (Baltimore, 1965); W. M. Frazer, *A history of English public health, 1834-1939* (London, 1950). For a valuable overview, see Christopher Hamlin, "State medicine in Britain", in Dorothy Porter (ed.), *The history of public health and the modern state* (Amsterdam, 1994), 132-64.
50. Dorothy Watkins, "The English revolution in social medicine, 1880-1911", Ph.D. thesis, University of London, 1984. The growth of isolation hospitals is discussed in Abel-Smith, *The hospitals* (ref. 16), chap. 8: "Transition — From Pauper Hospitals to Public Hospitals"; Gwendoline M. Ayers, *England's first state hospitals and the Metropolitan Asylums Board 1867-1930* (London, 1971). On the effectiveness of isolation hospitals, and developments in the care and treatment they provided, see John M. Eyler, "Scarlet fever and confinement: The Edwardian debate over isolation hospitals", *Bulletin of the history of medicine*, lxi (1987), 1-24; and Anne Hardy, *The epidemic streets: Infectious disease and the rise of preventive medicine, 1856-1900* (Oxford, 1993).
 51. Bentley B. Gilbert, *The evolution of National Insurance in Great Britain: The origins of the welfare state* (London, 1966); E. P. Hennock, *British social reform and German precedents: The case of social insurance 1880-1914* (Oxford, 1987).
 52. The Royal Commission on the Poor Laws, appointed late in 1905, provided an important forum where various schemes of rationalization could be aired by witnesses from all the relevant interest groups. Only a minority of the Commissioners favoured the creation of a specialist central department, but their views were taken up by an influential group of civil servants and politicians. See: Royal Commission on the Poor Laws and Relief of Distress, *Majority report* (2 vols, London, 1909); *Minority report* (ref. 48); and the many volumes of evidence that accompanied the Reports. A. M. McBriar, *An Edwardian mixed doubles: The Bosanquets versus the Webbs. A study in British social policy 1890-1929* (Oxford, 1987), provides a detailed analysis of the background, appointment and deliberations of the Royal Commission. The medical proposals are discussed in Steve Sturdy, "Public vs. private health: Preventive medicine and the minority report of the Royal Commission on the Poor Laws, 1909", unpublished paper. For developments following the Royal Commission, see Frank Honigsbaum, *The struggle for the Ministry of Health 1914-1919* (London, 1970).
 53. Honigsbaum, *The struggle for the Ministry of Health* (ref. 52), 13.
 54. On Chadwick's plans for a General Board of Health, see Finer, *Chadwick* (ref. 43), 301-5.
 55. Geoffrey Searle, *The quest for national efficiency: A study in British politics and political thought, 1899-1914* (Oxford, 1971). A partial survey of government reform from the 1850s to 1940 is offered by Peter Hennessy, *Whitehall*, rev. edn (London, 1990), 31-168, 292-9. A particularly clear illustration of state rationalization in the Edwardian period, which Hennessy practically ignores, is the establishment of the Committee of Imperial Defence in 1904 to coordinate military, naval and foreign policy, and to administer civil-military affairs: see Franklyn Arthur Johnson, *Defence by committee: The British Committee of Imperial Defence 1885-1959* (London, 1960); Searle, *National efficiency*, 216-35.
 56. Honigsbaum, *The struggle for the Ministry of Health* (ref. 52); Searle, *National efficiency* (ref. 55), 240-1, 255, 259. George Newman, one of the main architects of the new Ministry of Health and one of the most active proponents of medical rationalization, retrospectively acknowledged the extent to which the establishment of the Ministry had depended on the wider campaign to reform the machinery of government: Newman, *The building of a nation's health* (London, 1939), 103-12.
 57. Ministry of Health, Consultative Council on Medical and Allied Services, *Interim report on the future provision of medical and allied services* (London, 1920). On the background to the Report, see Charles Webster, "The metamorphosis of Dawson of Penn", in Dorothy Porter and

- Roy Porter (eds), *Doctors, politics and society: Historical essays* (Amsterdam, 1993), 212–28; and, on the deliberations of the Consultative Council, Frank Honigsbaum, *The division in British medicine: A history of the separation of general practice from hospital care 1911–1968* (London, 1979), chap. 6: “The Dawson Report”. Daniel Fox, *Health policies* (ref. 11), argues that the Dawson Report embodied a conception of what he calls “hierarchical regionalism” that was by that time coming to dominate health policy, not only in Britain, but also, with due regard to the differences in political and institutional setting, in America. The notion of primary and secondary health care, initially drawn from the sphere of education, has remained central to the discourse of British medical policy ever since.
58. Watkins, “English revolution” (ref. 50), 214–16; and Frazer, *A history of English public health* (ref. 49), 154. Debates over the notification of tuberculosis throw a particularly clear light on the tensions between the demands of private practice and public administration; see Watkins, “English revolution”, 221–5; Linda Bryder, *Below the magic mountain: A social history of tuberculosis in twentieth-century Britain* (Oxford, 1988), 41–42; F. B. Smith, *The retreat of tuberculosis, 1850–1950* (London, 1988), 68–69; and especially Hardy, *The epidemic streets* (ref. 50), 260–4.
 59. See Deborah Dwork, *War is good for babies and other young children: A history of the infant and child welfare movement in England 1898–1918* (London and New York, 1987), 139–43, 154–60.
 60. Christopher Addison, *Politics from within 1911–1918 including some records of a great national effort*, i (London, 1924), 14–16, 18, 28–29. Details of this scheme are discussed in a series of memoranda in the Christopher Addison Papers, Bodleian Library, Department of Western Manuscripts. See: J. Smith Whitaker to Addison, 10 March 1914, Addison Papers, Box 3, file marked “Memoranda — Rules etc. on adminⁿ of Medical Benefit”; J. Smith Whitaker to Addison, 25 April 1914, Addison Papers, Box 12; and Addison, “Improved health services — Insurance”, [1914], Addison Papers, Box 12.
 61. “General clinics”, n.s., n.d. [1914], Addison Papers, Box 12.
 62. “Note on the appointment and duties of the regional medical staff”, n.s., 19 April 1921, Addison Papers, Box 12, Folder 72. The Regional Medical Officers were expected to assist GPs in diagnosing and treating difficult cases, particularly where malingering was suspected, and to ensure that medical records were properly maintained. In 1920 these Medical Officers numbered thirty full-timers; by 1940 this had risen to nearly one hundred. Norman R. Eder, *National Health Insurance and the medical profession in Britain* (New York, 1982), 116, 176–7.
 63. See, for example: Jane Lewis, “The public’s health: Philosophy and practice in Britain in the twentieth century”, in Elizabeth Fee and Roy M. Acheson (eds), *A history of education in public health: Health that mocks the doctors’ rules* (Oxford, 1991), 195–229; Elizabeth Fee and Dorothy Porter, “Public health, preventive medicine and professionalization: England and America in the nineteenth century”, in Andrew Wear (ed.), *Medicine in society: Historical essays* (Cambridge, 1992), 249–75.
 64. George Newman, *An outline of the practice of preventive medicine: A memorandum addressed to the Minister of Health* (London, 1919); Steve Sturdy, “From Hippocrates to state medicine: George Newman on the early policy of the Ministry of Health”, in Christopher Lawrence and George Weisz (eds), *Greater than the parts: Holism in inter-war medicine* (New York, 1998), 112–34. David Armstrong has stressed the new surveillance role of GPs in the twentieth century: *The political anatomy of the body: Medical knowledge in Britain in the twentieth century* (Cambridge, 1983), 35–38, and 73ff.
 65. Cooter, *Surgery and society* (ref. 28), 113ff.
 66. Like the conceptually related notion of the “firm”, the exact origins of “teamwork” in medical discourse are obscure, though in this case it seems to have been imported from America. The

- practice, if not the term itself, was pioneered at the Mayo Clinic, and was explicitly embraced in the founding (in 1921) of the Cleveland Clinic of George Crile and his partners. The concept was broadly taken up by the new élite in medicine during the First World War: see Cooter, *Surgery and society* (ref. 28), 122 *et passim*. That teamwork was meant to be hierarchical rather than egalitarian is evident from the fact that when the idea of "teams" to carry out surgical operations was first proposed for the Western Front in January 1915, it was "with a view to preventing junior and inexperienced M[edical] O[fficer]s undertaking serious operations on their own responsibility": Sir Berkeley Moynihan, as quoted in an "Intelligence summary" report of 21 Jan. 1915, in Public Record Office: WO/95/44.
67. Bertrand Dawson, "The future of the medical profession: The Cavendish Lectures", *British medical journal*, 13 July 1918, 23–26 and 18 Oct. 1919, 56–60, at p. 23.
 68. Sir Arthur Newsholme, during discussion at the Royal Society of Medicine on "The future of the medical profession under a national health ministry", *British medical journal*, 20 April, 8 June, 15 June 1918, 456, 653–4, 673, at p. 456.
 69. Those who celebrated teamwork even rejected individualistic accounts of their own history: Harry Platt, for instance, cautioned against "claiming too much for our heroes": Platt, "The place of orthopaedics in medical education and in the regional hospital service", in his *Selected papers* (Edinburgh, 1963), 34. For a more formal discussion of the problematic place of virtuosity within a corporatist social framework, see for example, William H. Whyte, "The fight against genius", in his *The organization man* (Garden City, NY, 1956), 225–38.
 70. Anne Digby and Nick Bosanquet, "Doctors and patients in an era of National Health Insurance and private practice, 1913–1938", *Economic history review*, 2nd ser., xli (1988), 74–94.
 71. Doctors initially resisted being relocated in health centres, which they feared would lead on to the imposition of salaried practice, but looked more favourably on such proposals as the profession gave its qualified approval to plans for a National Health Service: Honigsbaum, *The division* (ref. 57), chap. 10: "Doctors reject collective surgeries", and pp. 185–6. On the fate of health centres and group practice after the establishment of the NHS, see Charles Webster, *The Health Services since the War, i: Problems of health care: The National Health Service before 1957* (London, 1988), 380–8.
 72. Among other rationalizing measures, the Cave committee recommended that the voluntaries standardize their accounting procedures. See Ministry of Health, Voluntary Hospitals Committee, *Final report* (London, 1921). See also John Pater, *The making of the National Health Service* (London, 1981), 4–13. For the Trades Union Congress and Labour Party's views, see their 1922 pamphlet, *The labour movement and the hospital crisis: A scheme for a hospital service*; Charles Webster, "Conflict and consensus: Explaining the British National Health Service", *Twentieth century British history*, i (1990), 115–51; and A. Marwick, "The Labour Party and the welfare state in Britain, 1900–1948", *American history review*, lxxiii (1967–68), 380–403, esp. pp. 386–90.
 73. Voluntary schemes for administering and coordinating hospital funding and admissions on a regional basis first developed through the growth of hospital contributory funds during the inter-war years: Steven Cherry, "Beyond National Health Insurance. The voluntary hospitals and hospital contributory schemes: a regional study", *Social history of medicine*, v (1992), 455–82. The Joint Hospital Boards initially coordinated admissions and services between voluntary hospitals in particular localities; in some cases, their remit was later extended to include local authority hospitals. See Abel Smith, *The hospitals* (ref. 16), 409–10; Pickstone, *Medicine and industrial society* (ref. 45), chap. 12: "The Manchester Joint Hospitals Advisory Board"; Sheffield Joint Consultative and Advisory Hospitals Council, *General statement of the position of the voluntary hospitals of Sheffield* (Sheffield, 1920). On coordination in London, see Prochaska, *King's Fund* (ref. 22), 111–12.

74. The Sankey Commission is discussed in Abel-Smith, *The hospitals* (ref. 16), 412–17. On the Nuffield Trust, see Gordon McLachlan, *A history of the Nuffield Provincial Hospitals Trust, 1940–1990* (London, 1992); and “Nuffield Hospitals Trust: Papers of Sir William Jameson, CMO, Ministry of Health”. Public Record Office: MH/77/24.
75. See Richard Titmuss, *Problems of social policy* (London, 1950).
76. Stevens, *Medical practice in modern England* (ref. 9), 139–52: Interdepartmental Committee on the Remuneration of Consultants and Specialists, *Report* [the Spens Report] (London, 1948).
77. Royal Society of Medicine, “Future of the medical profession” (ref. 68), 456.
78. *Ibid.*, 673.
79. Frank Honigsbaum, *Health, happiness and security: The creation of the National Health Service* (London and New York, 1989), 45, 48–49, 104–5.
80. “The British Medical Association’s proposals for a general medical service for the nation”, *British medical journal*, 26 April 1930, *Supplement*, 165–82; *British medical journal*, 26 September 1942, *Supplement*, 33. By 1938, some 90% of active GPs already derived some part of their income from NHI services: Webster, *The Health Services since the War* (ref. 71), 11.
81. Thus, for instance, consultants — who were given a considerable say in the organization and administration of the hospital services under the NHS — successfully resisted erosion of their privileges by blocking the promotion of junior doctors, and by favouring the advancement of their own institutions to the detriment of attempts at more coordinated development. See Social Services Committee, *Fourth report* (London, 1981); Rudolf Klein, *The politics of the NHS*, 3rd edn (London, 1995), chap. 2: “The politics of consolidation”.
82. Corporate, that is, not just in the sense that it involved a vertically integrated division of labour, but also in the sense defined by Middlemass: as a welfare measure, the NHS represented a highly effective political accommodation between the concerns and interests of labour, industry and the state. Middlemass, *Politics in industrial society* (ref. 8). On corporatism in the creation of the NHS, see Webster, “Conflict and consensus” (ref. 72), esp. pp. 139–51; Perkin, *Rise of professional society* (ref. 8), 344–8.
83. An important statement of this view is Christopher Hamlin, “Predisposing causes and public health in early nineteenth-century medical thought”, *Social history of medicine*, v (1992), 43–70. Hamlin stresses (p. 70) that this new medical perspective “appears not to have come about as a result of any particular scientific innovation or the triumph of any particular faction, but as a result of more general changes in the social relations of medical practice”. The transformation “marked the arrival of a medicine preoccupied with the relations of classes to one another and with economic and national efficiency”. See also John V. Pickstone, “Dearth, dirt and fever epidemics: Rewriting the history of British ‘public health’, 1780–1850”, in Terence Ranger and Paul Slack (eds), *Epidemics and ideas: Essays on the historical perception of pestilence* (Cambridge, 1992), 125–48; Roger Cooter, “Anticontagionism and history’s medical record”, in P. Wright and A. Treacher (eds), *The problem of medical knowledge: Examining the social construction of medicine* (Edinburgh, 1982), 87–108.
84. John Pickstone has proposed a series of “ideal types” of scientific knowledge and practice, which he traces to particular — and equally idealized — institutional modes of production: John V. Pickstone, “Ways of knowing: Towards a historical sociology of science, technology and medicine”, *The British journal for the history of science*, xxvi (1993), 433–58. Our analysis differs from Pickstone’s in that we seek to illustrate some of the specific historical processes by which one particular way of knowing — and one which, incidentally, cuts across Pickstone’s categories of “analytical”, “experimental” and “techno-scientific” knowledges — came to dominate British medicine by the end of the Second World War.
85. Michael J. Cullen, *The statistical movement in early Victorian Britain: The foundations of empirical*

social research (Hassocks, 1975); John Eyler, *Victorian social medicine: The ideas and methods of William Farr* (Baltimore, 1979); Simon Szreter, "The GRO and the public health movement in Britain, 1837-1914", *Social history of medicine*, iv (1991), 435-63.

86. See, for instance, J. Burdon Sanderson, "Address in physiology", and G. M. Humphry, "An address delivered at the opening of the Section of Physiology", both in *British medical journal*, 9 August 1873, 152-7 and 160-3 respectively; Michael Foster, "Vivisection", *Macmillan's magazine*, xxix (1874), 337-76.
87. John Simon was a key figure in promoting such work in central government: see Brand, *Doctors and the state* (ref. 49), 73-81; and, for an illuminating discussion of Simon's "technical-bureaucratic" administrative style and his inclination towards the establishment of universal scientific standards of environmental salubrity, see Bellamy, *Administering central-local relations* (ref. 49), 115-17 *et passim*.

Insufficient attention has been paid to the relationship between public health reform and the early development of experimental physiology in Britain. John Burdon Sanderson, for instance, served as MOH for Paddington from 1856 to 1867, before being appointed professor of physiology, first at University College, London, then at Oxford. During the early part of his academic career, he applied his laboratory skills in a number of public health inquiries instigated by Simon. One obituarist recalled that "the mental attitude of Burdon-Sanderson towards the problems presented by hygiene was one which impelled him to undertake a more profound experimental study of morbid processes, the subject being treated along chemical and physical lines without losing sight of the essential biological setting": F. G[otch], "Sir John Scott Burdon-Sanderson, Bart. 1828-1905", *Proceedings of the Royal Society of London*, ser. B, lxxix (1907), pp. iii-xviii, p. vii. Burdon Sanderson's appointment in Oxford was secured by Sir Henry Acland, himself a keen proponent of public health reform. Acland expected that Burdon Sanderson's work would form the basis for a new science of pathology: see H. W. Acland, *Oxford and modern medicine* (Oxford, 1890). Other leading physiologists who took at least a passing interest in public health were Michael Foster and C. S. Sherrington, both of whom contributed to the early twentieth-century campaign to promote health among pupils in the new national system of elementary schools: Michael Foster, *Simple lessons on health for the use of the young* (London, 1905); Edward W. Hope, Edgar A. Browne and C. S. Sherrington, *A manual of school hygiene* (2nd edn, Cambridge, 1913).

88. Bruno Latour, *The pasteurization of France*, transl. by Alan Sheridan and John Law (London, 1988). It should be noted, however, that the application, and indeed the applicability, of such techniques was itself fiercely negotiated in the political process of creating new administrative machineries; this is amply demonstrated in Christopher Hamlin, *A science of impurity: Water analysis in nineteenth century Britain* (Berkeley, 1990).
89. See, for instance, J. Burdon-Sanderson, "An address on the relation of science to experience in medicine", *British medical journal*, 11 Nov. 1899, 1333-5. Such arguments were similar to American claims for the clinical relevance of laboratory physiology: John Harley Warner, *The therapeutic perspective: Medical practice, knowledge, and identity in America, 1820-1885* (Cambridge, Mass., 1986), 248-51, 258-83.
90. Christopher Lawrence, "'Incommunicable knowledge': Science, technology and the clinical art in Britain 1850-1914", *Journal of contemporary history*, xx (1985), 503-20, stresses the highly personalized nature of medical accomplishment, but overemphasizes "gentlemanly" social virtues at the expense of other kinds of skill. See Peterson, *The medical profession* (ref. 29), 157-88, for the emergence of an autonomous professional discourse of medical skill. On the opposed rhetorics of skill and science in present-day medicine, see Warwick Anderson, "The reasoning of the strongest: The polemics of skill and science in medical diagnosis", *Social studies of science*, xxii (1992), 653-84.

91. Opposition to medical specialization was commonly cast in such terms. See Peterson, *The medical profession* (ref. 29), 273–4.
92. Much has been written on the disappearance of the patient's narrative with the rise of hospital medicine in the late eighteenth and early nineteenth century. This has commonly been read as implying a decline of individualized doctor–patient relations. See, inter alia, Nicholas Jewson, "The disappearance of the sick-man from medical cosmology", *Sociology*, x (1976), 225–44; Mary Fissell, "The disappearance of the patient's narrative and the invention of hospital medicine", in Roger French and Andrew Wear (eds), *British medicine in an age of reform* (London, 1991), 92–109. However, Michel Foucault emphasizes the reciprocity between the application of nosological schemata and the constitution of the individual as the subject of disease: *The birth of the clinic: An archaeology of medical perception*, (transl. by A. M. Sheridan) (London, 1976). Foucault's point has been endorsed, for the British setting, in a critical review by Christopher Lawrence: "The meaning of histories", *Bulletin of the history of medicine*, lxvi (1992), 638–45. Our own view is that the processes of diagnosis and treatment remained highly individualized: though doctors adopted an increasingly esoteric medical language, we would argue that such language was not primarily used to assign patients to impersonal pathological categories, but rather to reconceptualize the particular problems of individual patients.
93. R. A. Young, "Method in medicine", *British medical journal*, 7 October 1905, 881–3, p. 882.
94. *Ibid.*
95. L. S. Jacyna, "The laboratory and the clinic: The impact of pathology on surgical diagnosis in the Glasgow Western Infirmary, 1875–1910", *Bulletin of the history of medicine*, lxii (1988), 384–406. The best general account of the introduction of pathology laboratories into British hospitals is still to be found in W. D. Foster, *A short history of clinical pathology* (Edinburgh, 1961), chap. 6: "Clinical laboratories"; and S. C. Dyke, "Organization of clinical pathology to present day", *ibid.*, 124–42. For similar negotiations in America, see Geison, "Divided we stand" (ref. 2), and Russell C. Maulitz, "'Physician versus bacteriologist': The ideology of science in clinical medicine", in Vogel and Rosenberg (eds), *The therapeutic revolution* (ref. 2), 91–107; and especially Howell, *Technology in the hospital* (ref. 2), chaps. 3–7, for a nuanced discussion of the use and meaning of urinalysis, X-ray machines and blood analyses.
96. Hutchinson, "On the best mode of conducting special departments" (ref. 37), 413.
97. Sir Thomas Clifford Allbutt, "Medicine in the twentieth century", 1919 address to the British Medical Association, reprinted in his *Greek medicine in Rome with other historical essays* (London, 1921), 541–61, p. 545.
98. Allbutt went so far as to argue that the laboratory sciences had brought about "the fall of disease and the rise of the patient" and "the growing perception that there is no such thing as say, 'enteric fever' or 'diphtheria'"; such a perception implied that "each case will be treated, not according to its catalogued routine, but according to its individual needs": Allbutt, "Abstractions and facts in medicine" (ref. 37), 991. Similar view are expressed in Philip H. Pye-Smith, "Medicine as a science and medicine as an art", *British medical journal*, 4 August 1900, 280–4. On the rise of diagnostic nominalism and its implications for medical culture in the widest sense at this time, see: David Cantor, "The name and the word: Neo-Hippocratism and language in inter-war Britain", in Cantor (ed.), *Hippocrates and modern medicine* (Aldershot, forthcoming); Stephen J. Kunitz, "Classifications in medicine", in Russell C. Maulitz and Diana E. Long (eds), *Grand rounds: One hundred years of internal medicine* (Philadelphia, 1988), 279–96.
99. An early exemplar of the type was Thomas Lauder Brunton, a physician at St Bartholomew's hospital in London, who drew on physiological knowledge of the circulatory system when he suggested, in 1867, that amyl nitrite might be used to treat angina. This work helped to establish

him as "the most widely known consulting physician in London", as well as "one of the founders of modern pharmacology": J. A. Gunn, "Brunton, Sir Thomas Lauder", in H. W. C. Davis and J. R. H. Weaver (eds), *Dictionary of national biography, 1912-21* (Oxford, 1927), 75-76. On Brunton's pharmacological work, see William F. Bynum, "Brunton, Thomas Lauder", in *Dictionary of scientific biography*, ii, 547-8.

100. The dual possible configurations of laboratory medicine were realized, side by side, in Almroth Wright's commercially successful vaccine department at St Mary's Hospital, where therapeutic vaccines were produced to treat a wide range of conditions. The means of scientific production were so arranged as to maximize income from the sale of these vaccines: wealthy patients could have their own personal microbes cultured to produce bespoke vaccines specific to their individual cases; while poorer patients bought cheaper off-the-peg vaccines against particular categories of disease microbes. See Gwyn Macfarlane, *Alexander Fleming: The man and the myth* (Oxford, 1985), 64-66.
101. The provision of diagnostic laboratory facilities was recommended as a way of improving the efficiency of general practitioners in both the 1914 scheme for the extension of NHI practice, and in Dawson's proposals for the establishment of primary care health centre: memorandum on "Provision of laboratory facilities", n.s., n.d., Addison Papers, Box 12; Ministry of Health, Consultative Council on Medical and Allied Services, *Interim report* (ref. 57), 9, 11.
Such developments were not limited to state-sponsored insurance schemes; in the United States, private insurance companies also adopted new laboratory-based diagnostic technologies to promote uniformity of diagnosis among doctors: see Audrey Davis, *Medicine and its technology: An introduction to the history of medical instrumentation* (Westport, Conn., 1981), 185-6; Davis, "Life insurance and the physical examination: A chapter in the rise of American medical technology", *Bulletin of the history of medicine*, lv (1981), 392-406.
102. Linda Bryder, "Public health research and the MRC", in Joan Austoker and Linda Bryder (eds), *Historical perspectives on the role of the MRC: Essays in the history of the Medical Research Council of the United Kingdom and its predecessor, the Medical Research Committee, 1913-1953* (Oxford, 1989), 59-81, pp. 74-81.
103. For a suggestive glance at the theatrical and performative aspects of mid-nineteenth-century medicine and surgery, see Alison Winter, "Ethereal epidemic: Mesmerism and the introduction of inhalation anaesthesia to early Victorian London", *Social history of medicine*, iv (1991), 1-27, pp. 7-8. One observer at that time noted that "A public hospital or dispensary, is a theatre where the performer has to satisfy at once the general spectator, and the critics of the green room — the crowd to whom his display is addressed, and those behind the scenes, who are really conversant with his duty": quoted in Ruth Richardson, *Death, dissection and the destitute* (London, 1987), 314, n. 94. Those doctors who favoured efficiency reforms and a measure of division of labour in medicine and surgery often denounced this kind of self-advertisement. Thus, in a revealing passage, Lawson Tait condemned the fact that surgical operations were frequently made "the subject of vulgar theatrical display". He continued: "This strange perversion survives even to this day, and it makes me often sad to hear of the anxiety professed by many of my profession to 'see' some great surgeon perform some big operation — an operation which they themselves would never entertain a wish to undertake. Such performances, I think, ought to take place only in the utmost privacy and be witnessed only by such as can really be benefited by observing them, that is, men who wish to engage in operating practice and are likely to have fields in which to fulfil their wishes ... for an operating surgeon to have a theatre full of second year students merely for the purpose of being able to say that they were in the same room with him is a useless waste of time for the students, and for such purposes I wish all operating theatres were closed" (Lawson Tait, "Address in surgery" (ref. 25), 270).

In America, too, reforms in surgery were accompanied by a repudiation of the public admiration conjured up by the "heroic" image of the operator; see Gert Brieger, "From conservative to radical surgery in late nineteenth-century America", in Christopher Lawrence (ed.), *Medical theory; surgical practice: Studies in the history of surgery* (London, 1992), 216–31.

104. George Newman, *Some notes on medical education in England: A memorandum addressed to the President of the Board of Education* (London, 1918), 74–75. To this end, Newman and others argued that greater use should be made of hospital outpatient departments for teaching purposes: *ibid.*, 75; Royal Commission on University Education in London, *Final report* (London, 1913), 115. The relationship between Newman's educational views and his ideal of preventive medicine is also discussed in W. F. Bynum, "Sir George Newman and the American way", in Vivian Nutton and Roy Porter (eds), *The history of medical education in Britain* (Amsterdam, 1995), 37–50.
105. Royal Commission on University Education in London, *Final report* (ref. 104), 112 (our emphasis).
106. *Ibid.*, 111.
107. Royal Commission on University Education in London, *Final report* (ref. 104), 107–23; George Newman, "Grants to medical schools", memorandum to the Secretary of the Board of Education, 22 October 1918, Public Record Office: ED 24/1961; Newman, *Some notes on medical education in England* (ref. 104), 77.
108. Newman, *Some notes on medical education in England* (ref. 104), 74–77.
109. On Sheffield, see Arthur W. Chapman, *The story of a modern university: A history of the University of Sheffield* (London, 1955), 157–8, 228–9; for Manchester, G. Sims Woodhead, "Sheridan Delépine", *Journal of pathology and bacteriology*, xxv (1922), 113–17, p. 115; and for Liverpool, June Jones, "Science, utility and the 'second city of the Empire': The sciences and especially the medical sciences at Liverpool University, 1881–1925", Ph.D. thesis, University of Manchester, 1989, 220–32. The universities continued to develop such work well into the twentieth century, taking charge, for instance, of routine testing for syphilis when it was established in 1916: Frazer, *A history of English public health* (ref. 49), 341–4.
110. Royal Commission on University Education in London, *Final report* (ref. 104), 111.
111. The physiologist E. H. Starling, in particular, had for some time been campaigning for greater academic control of the London hospital medical schools, and his evidence to the Royal Commission on the University of London was taken, along with that of William Osler and Abraham Flexner, as the starting point for the Commission's recommendations for the creation of full-time chairs: Royal Commission on University Education in London, *Final report* (ref. 104), 101–2.
112. Steve Sturdy, "From the trenches to the hospitals at home: Physiologists, clinicians and oxygen therapy, 1914–1930", in J. V. Pickstone (ed.), *Medical innovations in historical perspective* (London, 1992), 104–23; Howell, "'Soldier's heart'" (ref. 10).
113. George Graham, "The formation of the medical and surgical professorial units in the London teaching hospitals", *Annals of science*, xxvi (1970), 1–22. Starling was offered, and accepted, the full-time chair of medicine at St Thomas's Hospital, but ill health prevented him taking up the post. Clinicians in a number of other hospitals fielded candidates from among their own ranks, in opposition to the University's physiological nominees: in most cases the clinicians were defeated.
114. Steve Sturdy, "Chemical physiology and clinical medicine: Academics and the scientization of medical practice in Britain, 1900–1925", in Ilana Löwy, Olga Amsterdamska, Patrice Pinell and John Pickstone (eds), *Innovation in medicine: Historical and sociological aspects* (London, 1993), 352–74.

115. In his evidence to the Royal Commission on the University of London before the War, Dawson had championed a scheme for involving laboratory scientists in clinical teaching, while preserving the overall dominance of the honorary clinicians: Royal Commission on University Education, *Final report* (ref. 104), 119–20.
116. The attack on academic clinical science, orchestrated by Dawson, Berkeley Moynihan and others, is detailed in David Cantor, "The MRC's support for experimental radiology during the inter-war years", in Austoker and Bryder (eds), *Historical perspectives* (ref. 102), 181–204, pp. 194–6; Christopher C. Booth, "Clinical research", in *ibid.*, 205–41, p. 214. For the assertion of a more individualized way of knowing, see Christopher Lawrence, "Still incommunicable: Clinical knowledge between the wars", in Lawrence and Weisz (eds), *Greater than the parts* (ref. 64), 94–111. For similar developments in America, see Theodore M. Brown, "George Canby Robinson and 'the patient as person'", and Sarah Tracy, "An evolving science of man: American constitutional medicine, 1920–1950", *ibid.*, 135–60 and 161–88 respectively. Also Sarah W. Tracy, "George Draper and American constitutional medicine, 1916–1946: Reinventing the sick man", *Bulletin of the history of medicine*, lxvi (1992), 53–89.
117. Education Committee, "Report on the revision of the curriculum in medicine", General Medical Council, *Minutes*, lix (1922), 185–201; and "Final report of the Joint Committee ... on the Place of Preventive Medicine in the Medical Curriculum", *ibid.*, lxxix (1932), 241–3.
118. Hostility flared, for instance, over clinical scientists' attempts to dominate radium therapy. The passage of the Cancer Act in 1939 transferred responsibility for cancer treatment from the voluntary to the local government hospitals, but the Ministry of Health and leading academic scientists agreed not to put academics in charge of such treatment for fear of antagonizing clinicians: Joan Austoker, *A history of the Imperial Cancer Research Fund 1902–1986* (Oxford, 1988), 167–72.
119. James Calnan, *The Hammersmith, 1935–1985: The first fifty years of the Royal Postgraduate Medical School at Hammersmith Hospital* (Lancaster, 1985).
120. Douglas Veale, "The Nuffield medical benefaction and the Oxford Medical School", in Kenneth Dewhurst (ed.), *Oxford medicine: Essays on the evolution of the Oxford clinical school to commemorate the bicentenary of the Radcliffe Infirmary, 1770–1970* (Sandford-upon-Thames, 1970), 143–53. From the mid-nineteenth century, Oxford University, like Cambridge, had concentrated on building up the pre-clinical sciences; the vast majority of undergraduates went on to the great London teaching hospitals for clinical training.
121. Most notably F. R. Fraser, who held the full-time chair of medicine at St Bartholomew's Hospital from 1920 until 1934, when he was appointed director and Professor of Medicine at the Royal Postgraduate Medical School. In 1939 the Ministry of Health made him consultant in general medicine to the Emergency Medical Service, and promoted him to director-general in 1941. Arthur S. MacNalty, obituary, "Francis Richard Fraser", *Journal of pathology and bacteriology*, xc (1965), 701–11.
122. Inter-departmental Committee on Medical Schools, *Report* (London, 1944). It is indicative of the close connections between educational reform and the rationalization of medical services that the committee was chaired by William Goodenough, the banker and hospital governor who also headed the Nuffield Provincial Hospitals Trust and who supervised the disbursement of Nuffield's monies for medical education at Oxford: Douglas Veale and Cuthbert Fitzherbert, "Goodenough, Sir William MacNamara", in E. T. Williams and Helen M. Palmer (eds), *Dictionary of national biography 1951–1960* (Oxford, 1971), 417–19.
123. Booth, "Clinical research" (ref. 116), 230f.
124. See Social Services Committee, *Fourth report* (ref. 81). The Goodenough Committee's recommendations for the reform of GP training are discussed in N. T. A. Oswald, "A social

health service without social doctors", *Social history of medicine*, iv (1991), 295–315, though Oswald concentrates on efforts to introduce an element of "social medicine", rather than on the continuing expectation that a considerable proportion of GPs' work should become more standardized and routinized.

125. Dyke, "Organization of clinical pathology" (ref. 95), 136–8.
126. Harry M. Marks, "Notes from the underground: The social organization of therapeutic research", in Maulitz and Long (eds), *Grand rounds* (ref. 98), 297–336.
127. On the role of clinical trials as a means of rationing scarce supplies of new drugs during and immediately following the War, see D. P. Adams, "The greatest good to the greatest number": *Penicillin rationing on the American home front, 1940–1945* (New York, 1991); David Cantor, "Cortisone and the politics of drama, 1949–55", in Pickstone (ed.), *Medical innovations* (ref. 112), 165–84.
128. Havelock Ellis, "The problem of the future of medicine", in his *Questions of our day* (London, 1936), 154–6, p. 155.
129. See: F. E. Manuel, "From equality to organicism", *Journal of the history of ideas*, xvii (1956), 54–69; Roger Cooter, "The power of the body: The early nineteenth century", in Barry Barnes and Steven Shapin (eds), *Natural order: Historical studies of scientific culture* (Beverly Hills, 1978), 73–92; Karl Figlio, "The metaphor of organization: An historiographical perspective on the bio-medical sciences of the early nineteenth century", *History of science*, xiv (1976), 17–53; Paul Weindling, *Darwinism and social Darwinism in imperial Germany: The contribution of the cell biologist Oscar Hertwig (1849–1922)* (Stuttgart, 1991); Steve Sturdy, "Biology as social theory: John Scott Haldane and physiological regulation", *The British journal for the history of science*, xxi (1988), 315–40; Stephen J. Cross and William R. Albury, "Walter B. Cannon, L. J. Henderson, and the organic analogy", *Osiris*, 2nd ser., iii (1987), 165–92; Roger Smith, *Inhibition: History and meaning in the sciences of mind and brain* (London, 1992).
130. Richard Gillespie, "Industrial fatigue and the discipline of physiology", in Gerald L. Geison (ed.), *Physiology in the American context 1850–1940* (Bethesda, Maryland, 1987), 237–62; Gillespie, *Manufacturing knowledge: A history of the Hawthorne experiments* (Cambridge, 1991); A. J. McIvor, "Manual work, technology, and industrial health, 1918–39", *Medical history*, xxi (1987), 160–89; Anson Rabinbach, *The human motor: Energy, fatigue, and the origins of modernity* (New York, 1990); Rabinbach, "The body without fatigue: A nineteenth-century utopia", in Seymour Drescher, David Sabeau and Allan Sharlin (eds), *Political symbolism in modern Europe: Essays in honor of George L. Mosse* (New Brunswick, 1982), 42–62.
131. Industrial Fatigue Research Board, *Annual report*, ii (1921), 17.
132. Thus the ideas and practices of preventive medicine were commonly argued to be a matter chiefly of "applied physiology": Jane Lewis, *What price community medicine? The philosophy, practice and politics of public health since 1919* (Brighton, 1986), 16. The new specialty of orthopaedics was likewise promoted as a form of physiological medicine peculiarly well suited to the needs of industrial society: Cooter, *Surgery and society* (ref. 28), *passim*.
133. Martin J. Schiesl, *The politics of efficiency: Municipal administration and reform in America, 1800–1920* (Berkeley, 1977); Raymond E. Callahan, *Education and the cult of efficiency: A study of the social forces that have shaped the administration of the public schools* (Chicago, 1962); and Samuel Haber, *Efficiency and uplift: Scientific management in the Progressive era, 1890–1920* (Chicago, 1964).
134. F. W. Taylor, quoted in L. Urwick and E. F. L. Brech, *The making of scientific management*, i (London, 1949), 10–11.