Both undergraduate and postgraduate medical education is changing and will need to change further to ensure adequate skills in learning and problem solving, communication, teamwork, information technology, ethics, and the behavioural and social sciences. We need to cooperate with the new systems of clinical governance to ensure the quality of clinical services, so long as they are not overly bureaucratic and are themselves audited to make sure they are fit for purpose. These new systems should not be seen as a threat or indeed as a substitute to self regulation, but rather as an adjunct.[10] Self regulation itself is a matter for all doctors and for their associations and colleges, not just for the General Medical Council. As such it should be supportive rather than simply punitive. The task at a local level is to help each of us to maintain and improve our practice, so that few cases reach the General Medical Council and result in publicity that damages the whole profession.[11]

It is possible that not only the way we practise but also the way the medical profession is organised will need to change to meet the challenges of modern medicine. A theme of Marinker and Peckham's book *Clinical Futures* is the role of doctors as diagnosticians and the distinction between generalists and specialists.[12–14] Perhaps the traditional distinction between the general practitioner and the consultant will disappear, to be replaced by the generalist physician based in the community but working in hospital and other settings, while the specialist, with high technical skills, will also operate in both community and hospital. But while healthcare teams become the norm, each of us still needs a personal doctor who can offer advice and support.[15] Perhaps the new generalist physicians will fulfil this role, but in any case we all need to remember that one day we too will be patients and want our doctors to care about, as well as for, us.

Even in this winter of discontent there are reasons for optimism. The profession has already indicated its willingness and ability to listen and to change; young people with intelligence, energy, and strong social consciousnesses still apply in large numbers to our medical schools; many doctors still gain deep personal satisfaction from their work. But if this is to continue there are other needs. Those of us who teach must be careful that we do not allow our frustrations to turn to cynicism and destroy the idealism of the young. The public needs a deeper understanding of the complexities of modern medical practice. And there needs to be wider understanding of the shortage of resources and the need to make choices. While doctors can play their part in determining clinical priorities, the public must help set the framework for resource allocation and politicians must accept their responsibilities. The advances in medical technology and the new systems of governance will cost significant sums, and even at Christmas "you don't get owt for nowt." Above all we need to accept our new role as advisers and partners to our patients. Our authority will come, not as an automatic accompaniment to the practice of medicine, but from the quality of our leadership.

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Socioeconomic differentials in the mortality of pets

Probably reflect the same differences in material circumstances as in their owners

Papers p 1686

Factors associated with mortality among dogs have not been extensively studied, though recent work has examined age, breed, and sex distributions of mortality.[1] There has, however, been little investigation of socioeconomic differentials in pet mortality. The study by Moloo et al in this week's issue (p 1686) is therefore welcome, although the results should be interpreted with caution.[2] They show that the probability of reporting the death of a pet in the past year is greater for young people from less favourable socioeconomic backgrounds than for those from more favourable backgrounds.

Pet ownership may have some influence on psychological health,[3] but it does not itself seem to influence mortality[4] and therefore the dynamics of mortality among pet owners are likely to reflect those of the total population. In this regard the socioeconomic inequalities in mortality—shown in a wide range of populations—will be a key feature. There has been considerable research into explanations of socioeconomic differentials in mortality among humans,[5] and similar categories of explanation may account for such differentials in pet mortality.

The "artefact" explanation suggests that socioeconomic differentials in mortality are more apparent than real, resulting from the way data are collected and analysed. In Moloo et al's study a potential artefact is created by the fact that the experience of a pet's death

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is analysed without information on whether the study household actually possessed a pet. Thus the results may simply reflect socioeconomic differences in pet ownership. In the United States[6] and in Sweden (A Egenvall, personal communication) ownership of a pet is positively associated with household income, though this plateaus at high incomes.[7] This pattern might, therefore, create higher probabilities of pet death in the past 12 months for affluent than for poor households and this will lead to the current data underestimating the true socioeconomic gradient in pet mortality.

A second artefact could relate to the type of pet. If poorer households were more likely to have pets with shorter lifespans—gerbils, mice, or birds—than richer ones then a higher probability of experiencing a death of a pet in the past 12 months would be expected. Evidence from the US suggests that ownership of most types of pets is higher among better off families. Finally, pets often die as the result of euthanasia, and poorer families might be more likely to put down their pets because of an inability to support the animal. Thus several reasons exist why the socioeconomic gradient in pet mortality might be artefactual.

Health related selection has been extensively investigated as an underlying cause of socioeconomic differentials in health among humans.[8] The basic proposition is that poor health leads to unfavourable social circumstances rather than vice versa. With respect to pet mortality possible health related selection would occur if poorer people took on pets who were less healthy or older at the time of acquisition. If this were so then higher mortality among the pets of less affluent families would be expected. This suggestion has some plausibility since one determinant of the cost of pets may be their health potential (though aesthetics seems more important). In humans evidence suggests that health related selection makes only a small contribution to overall health inequalities,[8] but the situation in pets is unclear.

A third category of explanation suggests that health related behaviour is responsible for socioeconomic differentials in health. Clearly the usual suspects—smoking and drinking—are unlikely to apply to pets. Differences in diet and exercise levels may exist between pets belonging to more or less affluent families. In humans it is important to recognise that health related behaviours do not simply reflect individual choice but relate to structural constraints on the lives of people in straitened circumstances.[9] This is even clearer with respect to the health related behaviours of pets.

Socioeconomic differentials in medical care may contribute to human health inequalities but are not considered key determinants.[10] There is some evidence of socioeconomic inequalities in veterinary care, although the degree to which this contributes to differentials in pet mortality is not known.

Psychological and psychosocial factors have been advanced to explain inequalities in health among humans. These include social support[11] and work stress.[12] More affluent families may have more pets than less affluent households, providing their pets with more elaborate social networks, but greater social support is not necessarily health inducing [13]; indeed, cats in multicat households may be more stressed. Work stress is clearly not a candidate factor. Indeed, pets serve as an additional largely non-working group (along with unemployed and retired people, and, earlier this century, many women) among whom socioeconomic differentials in health are seen which are at least as great as those in working populations.[14]

A final category of explanation relates to material and structural factors, the importance of which has probably been underestimated with respect to socioeconomic differentials in human health.[5] Advantage clusters cross sectionally and longitudinally across the course of people's lives, with those born in adverse circumstances having a higher risk of embodied inequality (in the form of low birth weight and short stature) and a lower probability of succeeding educationally. This leads to entry into less privileged sections of the labour market, exposure to low pay and hazardous work, and reliance on limited welfare payments in old age. Within this framework the way in which apparent "lifestyle" factors are outcomes of social processes which generate disadvantage in a wide variety of spheres becomes clear. For pets, the material circumstances they encounter will largely depend on the socioeconomic wellbeing of their owners.

The study by Moloo et al has many limitations and does not firmly establish the existence of socioeconomic differentials in pet mortality. However, if extrinsic—particularly violent—causes of death are put aside, then humans and other animals show some similarities in mortality dynamics.[15] A parsimonious explanation of health inequalities should perhaps account for differentials seen in different species, as well as for the fact that inequalities in mortality among humans are seen in different epochs and in different countries. In this light explanations solely in terms of artefact, selection, health related behaviours, or particular stresses seem parochial. The structuring of advantage and disadvantage in the material and social environment across the course of a life could reflect a more stable process of social differentiation. Further research into socioeconomic differentials in the mortality of animals other than humans may play a role in advancing our understanding of this basic process.

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Snapshots from the decade of the brain

Exciting, but no cause for triumphalism

Clinical review
pp 1696-708

The last 10 years of the 20th century have been designated the decade of the brain. But, with the notable exception of the revolution in brain imaging, the explosion of activity in neurobiology has failed to capture the imagination of most doctors. To remedy this, we asked six neuroscientists to write about what interested them most.

If you thought that visual processing was restricted to the striate cortex of the occipital lobes, turn to Adam Zeman's article (p 1696). More than 30 separate cortical representations of the visual field have now been identified, and positron emission tomography is revealing what each contributes to the analysis of complex visual stimuli. Richard Gregory also discusses vision, though from a different point of view (p 1693). He asks (and suggests an answer) why real time sensory inputs should be associated with conscious perception.

Consciousness, however one defines it, seems to be a property of the brain as a functioning system—not something that resides in individual neurones. Almost the opposite seems to be true of the way the brain keeps track of time. The central circadian clock is localised in the suprachiasmatic nucleus of the hypothalamus, but, as Michael Hastings explains, single nerve cells from this area retain the capacity to show a 24 hour rhythm even when isolated in culture (p 1704).

Ian Deary and Susan Greenfield tackle issues of more immediate clinical relevance. Deary discusses the validity of attempts to measure cognitive ability (p 1701), while Greenfield explores how recent discoveries about central neurotransmitters could be exploited for treating neurodegenerative disease (p 1698).

Understanding how the brain works requires more than knowledge of the intricacies of neuronal connections and neurotransmitters. In the last article Steven Rose points out the limitations of our current reductionist concepts (p 1707). He is especially scathing about the tendency to attribute complicated patterns of human behaviour—homosexuality or aggression, for example—to genetic polymorphisms. Along with A M Daniels' cow slaughtering piece (p 1728), it provides a salutary warning against triumphalist neuroscientific hype.

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Christopher Martyn *Associate editor, BMJ*

"No longer Gage": an iron bar through the head

Early observations of personality change after injury to the prefrontal cortex

In September 1848, in Cavendish, Vermont, an incident occurred which was to change our understanding of the relation between mind and brain. Phineas P Gage, a 25 year old railroad foreman, was excavating rock. In preparation for blasting he was tamping powder into a drill hole when a premature explosion drove the tamping iron—1.1 m long, 6 mm in diameter, and weighing 6 kg—through his left cheek and out of the vault of his skull with such force that it threw him on his back and fell several rods behind, "smeared with brain."[1] Despite his injuries he remained conscious and only a few minutes later was sitting in an ox cart writing in his work book. He recognised and reassured Dr Harlow, who had been summoned to the scene. The wound continued to bleed for two days; then followed a virulent infection that rendered Gage semiconscious for a month. His condition was so poor that a coffin had been prepared. Nevertheless, Dr Harlow continued treatment, and by the fifth week the infection had resolved and Gage had regained consciousness. He was blind in the left eye and had left facial weakness but no focal neurological deficits. Had the story ended there it would have been a remarkable account of Gage's endurance and Dr Harlow's therapeutic skill.

What made the event historic, however, was Dr Harlow's subsequent observations of the change in Gage's personality. Immediately after physical recovery he described Gage as follows: "Remembers passing and past events correctly, as well before as since the injury. Intellectual manifestations feeble, being exceedingly capricious and childish, but with a will as indomitable as ever; is particularly obstinate; will not yield to restraint when it conflicts with his desires." Dr Harlow reports that Gage's employers, "who regarded him as the most efficient and capable foreman … considered the change in his mind so marked that they could not give him his place again.… He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires.… A child in his intellectual capacity and manifestations, he has the animal passions of a strong man.… His mind was

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