the impression that this crudest form of genetic determinism is representative of the thinking of responsible biologists.

Wyke and I clearly disagree on the likelihood of science leading to the elimination of chronic disease by 2050. But we must still face the third, and for me the most important, question — even if the science were sound and her vision could be realized, should it be? Given the public response to genetically engineered food and the cloning of Dolly, scientists must be very sensitive to the extra-scientific aspect of science and technology. The chapter entitled “The Year 2050” depicts a world in which the benefits of the revolution are in place, and it is a world from our worst science-fiction nightmares.

People are connected to Compudoc computers that scan their bodies and connect them to MediMechanics who appear as smiling, white-coated, holographic images and order drugs to be delivered in dosages determined from analysis of the patient's genes held in the health corporation's computer. Or distance robotic surgical procedures — RoboSurgery — are carried out on people in the comfort of their Orwellian homes.

In a stunning chart that compares the pattern and nature of death in 1990 with what is predicted for 2050, we see that in this brave new medical world only 25 per cent of deaths will be from heart disease, cancer, diabetes and other diseases that killed more than 85 per cent of the population in 1990. This should be good news — the dream of high-tech “miracle” medicine fulfilled. But the chart for the year 2050 shows that 25 per cent of the deaths of a population presumably living well into their nineties will be by euthanasia and suicide, and another 20 per cent from homicide.

This, I fear, is what the lay public will focus on and ask why nonogenarians will want to end their lives in the presence of such “miracles”. They will assume that science is really offering the public a world in which the technology of medicine makes life unbearable for a quarter of the population. Ordinary people and legislators who fund science will find scant comfort from Wyke's statement that genetics can control the high murder rate because “2050s society may hold in its grasp the ability to alter genes controlling overpowering tendencies to murder and rob”.

But Wyke sees the social impact of this future quite differently. In the very next chapter she rails against the haughtiness of the medical profession for arrogating medicine to itself, and against the intrusiveness of regulatory agencies such as the US Food and Drug Administration for interfering with the ability of the market to reject bad drugs. “Medicine, indeed, appears destined to roll along the very same path as any other con-

sumer-led industry, with its hitherto dominant components, in this case doctors and governments, being relegated to mere participants catering to the public's various needs.”

Wyke thinks that the invisible hand of the market will manage these “miracles”. But I doubt whether Adam Smith himself would have thought that consumers could have any power to influence the corporations that would run the computers containing all the genetic, psychological and economic data. The hand of the medical market Wyke foresees is very visible indeed, and may be part of the reason for a quarter of the population choosing suicide and euthanasia.

The most perplexing thing about her book is that Wyke knows this. The last two chapters are devoted to the role of caring, human contact between patient and doctor, the unexplained power of the placebo, and the fact that people are turning away from the coldness of scientific medicine as it is too often practised in favour of alternative medicine. She is clearly aware of the danger of the loss of privacy in an electronic world. I reread these chapters several times trying to reconcile their content with the vision of the computerized, roboticized twenty-first-century medicine that is the central message of the book.

I began to suspect that the vision of Compudocs, Robodocs, vast computer databanks containing the most intimate information about our lives, genes replaced to make us ‘normal’, and finally the grim vision of people queueing up to end their lives, was too much for her.

But I am probably wrong, and my suspicion may be only a reflection of the fear I have that *21st-Century Miracle Medicine* will frighten its audience more than it will excite them, and will blind them to the great potential good science can bring to medicine. The mysticism of Deepok Chopra and the alternative medicine of Andrew Weil are already increasing in popularity, and growing numbers of people are turning away from scientific medicine to New Age healing. Scientific medicine is certainly capable of using the enormous insights we are gaining into normal function and disease to improve people's lives without enslaving them to an all-intrusive, computer-driven, medical delivery system.

The control people want over their lives, and medicine that uses technology to enrich rather than enslave that Wyke talks about in the last chapters, will not come from the uses of technology she describes in earlier chapters. The book describing that vision of twenty-first-century medicine remains to be written. □

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War of the rosé

Science, Vine, and Wine in Modern France

by Harry W. Paul

Cambridge University Press: 1997. Pp. 355.
£45, \$64.95

Bernadette Bensaude-Vincent

Having been born into a family of vine-growers, near Montpellier in the south of France, I remember well that the history of our village was divided into two periods — before and after the phylloxera that devastated the vineyards from 1875 to 1900. This plague deprived the region of its main source of revenue and its effects entered the collective memory of our village in the same way as the First World War later left its mark. From Harry Paul's fascinating account of the episode, we learn that the plague was, in fact, a war — a multifaceted war.

First, it was a war of men against an invisible enemy, a small insect known as *Phylloxera vastatrix*. To help the farmers, who initially tried to drown the pest by flooding the vineyards, troops of scientists were mobilized. A national academic committee, presided over by the chemist J. B. Dumas, recommended the use of potassium sulphocarbonate as an insecticide. The chemical warfare proved ineffective and the vines, already weakened by diseases such as mildew, died.

Plant scientists from the school of agriculture in Montpellier advocated their own programme of replacing the dead vines with French ones grafted on to American rootstocks. There followed a scientific controversy between this government-approved programme and an alternative solution of replacing the dead vines with direct-production hybrids that were more resistant to insects and would therefore not require extensive use of chemicals to protect them.

This second war — between the pro-grafting ‘Americanists’ and the partisans of hybridization — was conducted through laboratory experiments which, in turn, generated a secondary conflict between laboratory scientists and large-scale experimenters who argued that conclusions inferred from ‘pot-vines’ were not valid for vines in the field.

The pro-grafting school of Montpellier, supported by the government, spread its message among farmers through journals and popular conferences. The hybrid camp replied by establishing its own journals and by mounting a vigorous anti-academic campaign against ‘official science’. Although hybrids still flourished in a seventh of France's vineyards until 1940, by the 1910s the alternative grafting programme was already considered the winning solution and the one founded on scientific certainties.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

Battle fields: Harry Paul unearths a social tension between small producers and owners of big vineyards in early twentieth-century France.

Paul's penetrating analysis of this controversy shows the underlying social tension between small producers who favoured the hybrid programme and owners of big vineyards who favoured the riskier solution of grafting which gave higher-quality wines.

After analysing the misadventures of vines, Paul turns to the science of wine. He describes the emergence of oenology as a cross-disciplinary science, one that, despite the leading role of chemists in its development, has never been considered a part of applied chemistry. Most French oenologists worship a trinity of founders of their discipline: Jean-Antoine Chaptal, the pioneer in the 1810s; Louis Pasteur, the 'father of oenology' from the mid-nineteenth century; and Jean Ribèreau-Gayon, the promoter of modern oenology in the 1930s.

In presenting this standard account, Paul keeps an ironic distance yet he offers no real revision of it. To construct an alternative historiography of oenology would require further investigations of neighbouring disciplines, including botany and chemistry. In particular, the alliance between producers and academic scientists needs to be understood within the context of the development of agricultural chemistry and agricultural stations throughout France.

By contrast, Paul is more innovative in his geographical approach to the development of oenology where he emphasizes regional styles of science. The wines from Champagne, Burgundy and Bordeaux, and the ordinary *vins de table* from Languedoc, each called for different sciences. Although the school of Montpellier eventually became the leader of viticulture and that of Bordeaux the leader of modern oenology, the various schools rivalled one another and sometimes entered into controversies. One of the most memorable disputes con-

cerned the effects of the method of heating wine — known as pasteurization because it was recommended by Pasteur — on the quality of the wine.

A fascinating issue emerges from Paul's approach: how can one articulate a scientific knowledge of wines when their main characteristics and values are dependent on local circumstances? How, in other words, can one apply universal laws and rules to a product of the local terrain and climate? Regrettably, however, this issue is never explicitly discussed by Paul, even though it seems to dominate his book's structure.

Paul is more concerned with another challenge of the science of wine: how can one quantify qualities of taste? He carefully describes the complex process of wine making and the transformations it has undergone. He emphasizes the dream of scientists of the late nineteenth century that wine making could be scientifically controlled. Repeated attempts to identify the cause of the individual taste of each *cru* in the nature of the yeast were defeated by "the caprices of the yeast".

It was thanks to the development of physical chemistry, by the turn of this century, that scientific control of the wine-making process was made possible. The ionic approach developed in the 1930s by Ribèreau-Gayon, in particular his careful study of oxidation at various stages of wine processing and in the ageing of wine, reinforced the programme of the "apostles of chemistry".

Paul is reticent about today's attempts to produce high-technology wines. He concludes that since the 1930s oenology has done more to improve the standardization and preservation of wines for commercial purposes than to improve their bouquet. But this is not a kind of romantic nostalgia for the

original product, because Paul emphasizes strongly that wine has never been a natural product, but rather has always been an artefact. That is the personal opinion of a connoisseur of French wines.

This book will doubtless interest all wine connoisseurs and entertain scientists. It is, moreover, extremely useful in turning the attention of historians' towards a neglected science, one whose hybrid status between science and technology, and between cognition and commerce, is fascinating. □

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A Darwinian Universe?

The Life of the Cosmos

by Lee Smolin

Oxford University Press/Weidenfeld and Nicolson: 1997. Pp. 320. \$30, £20

George Ellis

Lee Smolin presents an intriguing attempt at a cosmological synthesis of three of the major discoveries of modern science — the evolution of the Universe from a hot Big Bang, the quantum nature of fundamental physics, and the Darwinian theory of evolution by natural selection. It is the in-depth development of the latter aspect that makes the book unique.

The author takes various themes from the recent literature on cosmology — the anthropic issue (why is the Universe of such a nature that it admits the existence of life?), chaotic inflation (proposing many separate expanding regions in a self-reproducing chaotic Universe, with a process of 'mutation' leading to variation of fundamental physical constants) and quantum cosmology (investigating the initial conditions of the Universe) — and weaves from them a proposal for a unified view of the Universe. This is based on two overriding principles: first, that all fundamental physics in the end is relational, and second that evolutionary selection (through mutation leading to differential reproduction rates) is the only physically based process that is in principle capable of generating new kinds of self-organized non-equilibrium structures.

He therefore arrives at the concept of the Universe itself evolving by a process akin to Darwinian evolution. Many successive collapses of stars into black holes generate new expanding regions of the Universe with slightly different physics. The regions that come to dominate are those where local physics is such that production of black holes (and hence of new baby universes) is most likely. These universes are then claimed to be likely to allow the evolution of life, and hence our own existence.