

The digital and genetic revolutions signal enormous changes to the way we live. But will they bring happiness and fulfilment? asks **Patrick Dixon**

Designer People in a Digital Age

Two great revolutions will dominate the first two decades and beyond of the third millennium: digital and genetic. Both will profoundly affect every aspect of human existence including medicine. The digital revolution changes what we do, the genetic revolution changes who we are. The combination of the two will result in new forms of human life - but is that how we really want to live?

The digital revolution is non-controversial, and hyped with enthusiasm. This is in contrast to the genetic revolution which is almost always underplayed by those involved, scared of public hysteria and over-regulation.

The Digital Revolution

Computers will bring extraordinary improvements in imaging and other diagnostic aids, as well as allowing virtual consultations and even remote surgery. However the real impact will strike to the very core of what it means to be a doctor today.

Medical knowledge is too vast for human brains. The days of doctors being allowed to make decisions without consulting robots are coming to an end. It is already the case that computers are better at making some diagnoses than most physicians.

In future any doctor failing to consult the digital expert will risk being sued for negligence. The digital expert (robot) will have total knowledge of every research paper, every drug trial, and every previous outcome of particular treatment decisions in similar presenting circumstances. And every day the digital expert will improve.

Current medical training is caught in a late twentieth century timewarp, based on the notion that every doctor can carry in his or her head on the day of qualifying enough information to practise safely for many years. In practice, medical knowledge is now dangerously dated. In a couple of years and with the speed of progress, this is likely to get worse.

Future doctors will be trained to be world-class experts on eliciting symptoms and signs, on taking a thorough history - albeit prompted by the machine. They will also have highly developed personal skills:

empathy, trust-building, high-touch. They will have enough general understanding to pick up major machine errors, but not enough to challenge. It will be a brave doctor in 2020 who insists on going against the cumulative wisdom of the entire profession or dismissing the machine's instructions. Will they be doctors at all? Perhaps not, since in the majority of cases a well-trained nurse will do it all just as well.

The surgeon as a highly skilled technician will survive largely unchanged, although relying ever more heavily on micro-technology. And some of the implants will be digital, including chips onto which nerve cells have been grown, allowing brain to digital and digital to brain transfers of commands, visual information or perhaps in the future even thought and emotion. Rats are already controlling equipment in their cages by thinking alone.

The Genetic Revolution

Few have considered the extraordinary results of the fact that the code of life is universal, allowing an infinite range of gene swaps between plants and animals as well

as between individuals. Gene technology will allow doctors to target and destroy an ever wider range of fetuses which fall short of parental hopes in predicted intelligence, height, athletic capability and other factors.

Viruses will be widely used to infect and reprogramme human tissues and organs as required, not only to cure disease but also to enhance lifestyle. For example, viral hairsprays will create permanent colour changes.

Replacement tissues will be widely used, following the discovery that you don't need to create entire cloned embryos of existing people as a source of stem cells. New techniques will persuade many different cell types in adult bodies to revert to a more primitive form, before re-activation to make new specialised cells. Brain repair will become routine, not only after localised damage, but also to strengthen mental powers in old age. Spinal repair will also be successful.

Those wanting entire organs or new bodies will continue to borrow from the living or the dead. Hand and arm swaps will become common, together with legs and feet. The demand for head transplants will grow

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What happens when we combine the digital and genetic revolutions and what will be the effect on human happiness - indeed survival? Imagine a human being with transplanted limbs, many tissues enhanced or reprogrammed altogether, with brain-embedded digital technology. This is hardly science fiction since all the individual components are already here or almost within our grasp.

But human happiness will continue to remain elusive. History shows that the more technological a society becomes, the higher the demand for psychotherapists or antidepressants, and the higher the suicide rate.

Happiness clearly does not reside in longevity alone, nor even in physical health. Quality of life is the prime driver in the quest for new treatments and cures, indeed for all medical progress, but the reality is disappointing. Human nature is unchanged and so are personal needs: for love, understanding and a sense of significance or destiny. Relationships have always been for most people the central key to personal fulfilment and wellbeing. Spirituality - or a relationship with the Ultimate Being - is part of this.

Expect therefore a growing reaction against 'soul-less' science with its grand promises of building a better world, but obvious failures to deliver. Expect a boom industry in happiness specialists, dispensing not happy pills, but personal, practical advice on every aspect of human existence, based on rigorous research. These modern day priests to progress will be the new value leaders, shaping opinion and expectations.

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Dame Cicely Saunders Care for the Dying

Dame Cicely Saunders (born 1918) is acclaimed for her pioneering work with the hospice movement and her contribution to greater public understanding of the care of the dying. Inspired by a dying agnostic Jew in 1948 who left her the first gift for a 'home', she had seven years experience as a volunteer nurse at St Luke's Hospital in Bayswater founded by Methodists in 1893. A surgeon impelled her to read medicine to develop the pain control she had seen there. This she did at St Joseph's Hospital, Hackney, which was founded by the Irish Sisters of Charity in 1905. Working together with them she developed the modern hospice movement of which the first example is St Christopher's Hospice in Sydenham, opened in 1967 as a Christian and medical foundation.



rapidly, as hope grows that quadriplegic patients could regain good motor and sensory function so long as they live long enough. In a world where tens of millions still starve or die from lack of simple medication, such use or abuse of resources will be regarded by many as wrong.

Genetics will be used to build drug molecules inside living cells - bacteria, fungi or mammals - providing a new range of hyper-medicines, compounds so complex that they cannot be created any other way. A factory the size of a nuclear power station can be compressed into a single bacterium, which will go on self-replicating forever.

Many of the new generation of medicines will be 'smart drugs' designed as life-enhancers rather than health promoters: drugs to improve memory in students, sexual performance in middle aged men, skin elasticity in older women. Life-enhancement will become an important sub-specialty in life-sciences.

Human cloning will be a standard infertility clinic option in some countries by 2020, despite widespread public unease and outright disapproval in many nations.

Over the last three years more than a million transgenic animals were born in British laboratories alone, perhaps 250,000 of them containing human genes. By 2020, perhaps a hundred million such animals will be made each year globally, each a laboratory mutant unlike any creature ever seen before in the history of the earth.

Some of these variants will blur the distinction between vet and doctor. How many human genes will a monkey have to have to gain human rights and a place in a hospital bed? The answer is less than 1.6% since we only differ from monkeys by less than 3% of our genetic code. For the Christian there is another question: how many genes does an animal need to have to need salvation?