

## Inventive minds.

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FROM wonder bras to cars. From lipstick to space travel. Light globes, steam engines, nylon pantihose, microchips, non-stick pans, lasers, computers, penicillin, phones ... the list is endless. These are things that pop into mind when we think of the great inventions that have changed our lives.

But what were the big breakthroughs 1000 years ago? Back then, the Chinese were the big guns and innovators. In 1044, three new recipes for gunpowder were published and, four years later, the hot invention was movable type for printing Chinese characters, made from clay squares. After that, it took more than 200 years for the first gun to appear.

While the Chinese had the sophistication of gunpowder, in the West the battle of Hastings was raging on with low-tech arrows. We can at least claim Venetian glass began to emerge around 1000. Apart from that, we didn't really get our act together until after the Gutenberg press. In England in 1611, we have the first reference to a "nut and scrue" now that was real progress.

In the past century, many machines and engines came of age. Charles Babbage produced a mechanical calculator in the 1820s, leading the way for the computer age yet to come. In that same decade, Baron Jons Berzelius, a Swede, isolated the element silicon. This laid the foundation for the birth of the silicon microchip in the 1960s. But let us not give hi-tech all the glory. Our lives are just as profoundly changed by the underground sewerage systems built in the past century. In 1886, the flushing toilet was invented by Thomas Crapper in the very same year as Coca-Cola soft drink. Let us not mock the importance of the humble flush. Distinguished names like Crapper must go up in lights with Einstein, Edison and Faraday in terms of impact on everyday life.

And then, of course, there is Mary Phelps Jacob, a New York socialite, who in 1914 whipped up the first elasticised brassiere after failed experiments with tying handkerchiefs around her pectorals.

We may ask where Australia was in all these developments? **Adelaide**-born William Lawrence Bragg won the Nobel prize in 1915, jointly with his father, for work on X-ray crystallography. Bragg jnr was only 25, which makes him the youngest to win the prize, to this day.

The X-ray techniques he developed were used for finding the atomic structure of crystals and were crucial in discovering the double-helix structure of DNA by Crick, Watson and Wilkins in the 1950s. This is considered to be one of the greatest discoveries in biology.

Another fundamental breakthrough was in 1827, when Scottish botanist Robert Brown found that pollen dust, on a film of water, moved randomly when observed under a microscope. This so-called "Brownian motion" totally stumped scientists for decades, until a new kid on the block called Albert Einstein popped up with the correct explanation, in 1905, confirming the atomic nature of matter. The pollen particles were being jiggled by the water molecules. It turns out that the theories of random behavior developed from the work of Brown and Einstein are crucial for fully understanding the behavior of electrons in transistors. The same theories have even been applied to random fluctuations of the stock market.

In fact, Brownian motion turns up in nearly every science discipline. What the science books gloss over is that the pollen that Brown used was from Australia. He sailed to Australia between 1818 and 1822, and the fascination of Australian flora led him to look at pollen under the microscope.

Now here's something fascinating. Bragg, a physicist, makes a discovery that helps biology; whereas Brown, a botanist, does something that benefits physics and electronics. This is the clue to where technology is going in the next millennium.

Think about this. A hundred years ago, we had only physics, chemistry and biology. Now we have biophysics,

biochemistry, biomechanics, mechatronics, econophysics, biophotonics, biotechnology etc. So the trend is towards mixing the disciplines or "multidisciplinarianism". Notice that most of these buzz words have a "bio" in them these days. Next millennium's hot area is biologically inspired engineering and biomedical engineering.

Consequently, watch this space for what is known as MEMS (micro-electro-mechanical systems) or "micromachines". These are tiny machines that are a few millionths of a metre in size and can be integrated on a silicon microchip. These micromachines may one day become "smart pills" that search and destroy unwanted viruses.

This type of technology is also the link for interfacing human nerve endings to electronics (eg for a bionic ear for the deaf). Another example is the reusable contraceptive. Imagine a small micromachine valve implanted in the female ovarian tubes or the male sperm duct. The valve could be magnetically operated, so that we could switch fertility on and off. This would be a far cry from the first contraceptive, invented by the Egyptians in 2000 BC, which was a vaginal plug made of lint, ground acacia branches and honey, wrapped in papyrus. At the moment, our computers have only sound and vision. With the advent of the bionic nose, our home computer will be able to monitor food freshness, smell burglars and burning toast. Our computers will also have intelligent tactile transducers for transmitting touch. This will be useful for people who are visually impaired.

And what are the social and moral implications of telesex? Some people might be offended if their "significant other" was connected online over the Internet to Claudia Schiffer or Brad Pitt. How would you feel? Does it make a difference if it is live or prerecorded? Prerecorded sessions can be played back to thousands of people. We copyright poetry, music and genes will Madonna be able to copyright her bodily movements? Will this technology reduce incidence of STDs?

Although we are getting so clever at understanding and developing new technology, as a human race we fail miserably at understanding ourselves and each other. Perhaps, in the next millennium, things will come full circle and machines may become powerful enough to teach us something about ourselves?

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