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# Technology Quarterly

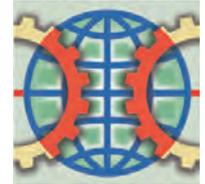
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## Changes in the air

The emerging technologies that will  
define the future of flight

# Difference engine | Worrying about wireless



**Technology and society:** Concerns about the danger posed to human health by radio waves are misplaced—and increasingly irrelevant. The use of phones while driving is far more likely to cause harm

**A**LTHOUGH the myth that mobile phones cause cancer has been laid to rest, an implacable minority remains convinced of the connection. Their fears have been aggravated of late by bureaucratic bickering at the World Health Organisation (WHO). Let it be said, once and for all, that no matter how powerful a radio transmitter—whether an over-the-horizon radar station or a microwave tower—radio waves simply cannot produce ionising radiation. The only possible effect they can have on human tissue is to raise its temperature slightly.

In the real world, the only sources of ionising radiation are gamma rays, x-rays and extreme ultra-violet waves, at the far (ie, high-frequency) end of the electromagnetic spectrum—along with fission fragments and other particles from within an atom, plus cosmic rays from outer space. These are the sole sources energetic enough to knock electrons out of atoms—breaking chemical bonds and producing dangerous free radicals in the process. It is highly reactive free radicals that can damage a person's DNA and cause mutation, radiation sickness, cancer and even death.

By contrast, at their much lower frequencies, radio waves do not pack anywhere near enough energy to produce free radicals. The “quanta” of energy (ie, photons) carried by radio waves in, say, the UHF band used by television, Wi-Fi, Bluetooth, cordless phones, mobile phones, microwave ovens, garage remotes and many other household devices have energy levels of a few millionths of an electron-volt. That is less than a millionth of the energy needed to cause ionisation.

All of which leaves doctors more than a little puzzled as to why the WHO should recently have reversed itself on the question of mobile phones. In May the organisation's International Agency for Research on Cancer (IARC) voted to classify radio-frequency electromagnetic fields (ie, radio waves) as “a possible carcinogenic to humans” based on a perceived risk of glioma, a malignant type of brain cancer.

A year earlier, after a landmark, decade-long study undertaken by teams in 13 countries, the IARC had reported that no adverse health effects associated with the use of mobile phones could be found. As for the heating effects of radio waves, the

increase in temperature of the skin caused by holding a phone close to the ear was found to be an order of magnitude less than that caused by direct sunlight.

The Group 2B classification the IARC has now adopted for mobile phones designates them as “possible”, rather than “probable” (Group 2A) or “proven” (Group 1) carcinogens. This rates the health hazard posed by mobile phones as similar to the chance of getting cancer from coffee, petrol fumes and false teeth.

That has not stopped the tinfoil-hat



brigade from continuing to believe that deadly waves in the ether are frying their brains. Lately the paranoia has spread to the smart meters being introduced by electrical utilities in various parts of the world. Smart meters are designed to relay wireless messages to the power company about a household's pattern of electricity use. Such real-time data could help utilities manage their generating capacity more intelligently.

But a backlash among homeowners in northern California, who fear they are about to be drenched in dangerous radio waves, has forced a handful of municipalities to slap moratoriums on the smart meters being introduced by Pacific Gas & Electric. Customers will be given the option to keep their old analogue meters, but will be charged for having someone come to read them every month.

Actually, smart meters are just about the last thing that people need worry about. In an independent study released in April, the California Council on Science and Technology, an advisory arm of the state legislature, concluded that wireless smart meters produce much lower levels of radio-frequency exposure than many existing household devices—especially microwave ovens. The council noted that, to date, it had not been possible to identify any health problems resulting from potential non-thermal effects of radio waves (should such effects exist). But nor had it been possible to show categorically that there weren't any.

## You can't prove a negative

The latter is next to impossible. Indeed, by classifying mobile phones as a Group 2B risk, what the IARC was effectively saying (and the California Council on Science and Technology implying) was that, even if such a health risk exists, there is no way of ever ruling out bias, chance or other confounding circumstance with any reasonable degree of confidence. So, to hedge bets, protect careers and guarantee future funding, the obvious thing to suggest is yet more research on the long-term, heavy use of mobile phones. The most likely result is that the results will be equally inconclusive.

And equally irrelevant. The Twitter generation tweets and texts rather than talking. Older people are catching up fast. According to Nielsen, a market-research firm, the number of text messages sent and received by Americans aged between 45 and 54 rose by 75% in the year to the second quarter of 2010. Over the same period, the number of phone calls made and received by adults of all ages fell by 25%. Meanwhile, for those who still insist on yakking, hands-free is fast becoming the norm, thanks to stiffer penalties for using handsets while driving and the spread of Bluetooth headsets.

The whole brouhaha over mobile phones causing brain cancer is a monumental irrelevance compared with scoff-laws who insist on using their handsets to text or talk while driving. Regretfully, that is a far more likely cause of death or disfigurement than some inexplicable form of radio-induced glioma. ■