

Tomorrow's world today: How far are we from the invisibility cloak?

Invisibility cloaks are set to become a reality. So where are our X-ray specs and rocket boots, asks Rhodri Marsden

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¹ While scientists continue to pull off extraordinary feats of ingenuity in harnessing our physical world, there are a few technological advances that have, over the years, proved to be stubbornly resistant. True, some of these futuristic gadgets or processes may only have been promised during fantasy sequences in novels penned by science fiction authors but, nevertheless, things such as hover boards, space tourism and cryogenic freezing have piqued the human imagination sufficiently for extensive research – both expert and amateur – to be done into their viability.

² Earlier this month, it was revealed that two teams of scientists at the University of California were working on projects which had succeeded, to some extent, in bending light around objects in order to render them invisible. Despite it being emphasised by those involved that this didn't mean

invisible jackets being available at Topshop anywhere in the near future, the notion of a Harry Potter-style Cloak of Invisibility was immediately *pounced upon*.

³ The idea of being able to *prowl around*, unseen, concealed by some kind of magic garment was, understandably, more enticing than in-depth analyses of transformation optics. But the work being done in California is the latest of a number of investigations into the manipulation of light, and specifically the ability to render objects invisible.

'invisibility is the tip of the iceberg'

⁴ Two years ago, mathematicians in the UK, including John Pendry at Imperial College, in London, outlined the calculations required for an optical cloaking device; in

April 2007 engineers at Purdue University, in the US, then followed these guidelines to come up with a theoretical arrangement of 'nanoneedles' that would be able to bend light around an object, in a similar way to water *flowing around* a stone. The work, funded for obvious reasons by American military and intelligence agencies, succeeded in making an object slightly smaller than a hockey puck invisible to a machine that 'sees' using microwaves.

⁵ The long-term implications of this work are hard to grasp; indeed, one of the researchers on the current Californian project found themselves saying 'it's kind of weird' in a newspaper interview. But it's conceivable that these experiments will eventually *move beyond* microwaves and into the visible spectrum used by the human eye. Indeed, Vladimir Shalaev, who continues to work in this field at Purdue, believes that invisibility ➡

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➡ is the tip of the iceberg: 'For example, you could make things appear to be located where they are not, or focus massive amounts of energy on microscopic spots.' But Shalaeve surely knows what the public really want: a magic cloak. Sci-fi movies have made us expect them to be invented – along with a similarly fantastic array of futuristic objects.

'The Holy Grail ... is to develop a robot that's as humanlike as possible'

X-Ray Specs

⁶ While Superman's X-ray vision was probably invaluable in the fight against crime – spotting weapons concealed by evil henchmen and so on – the 1978 film starring Christopher Reeve chose instead to showcase his ability to see Lois Lane's pink underwear. And therein lies the lasting appeal of the notion of X-ray spectacles; they might well let you see the contents of a lorry, but that's nowhere near as exciting as seeing through a polyester tank-top.

⁷ Backscatter X-ray machines, which provide clothes-less images of passing humans, are in use in parts of Heathrow Airport to search for weapons – but again, it's the fact

that breasts and genitals might be visible that both *grabs headlines* and attracts criticism from civil liberties campaigners. The one consolation is that a backscatter X-ray machine is way too cumbersome ever to be mounted in a frame and balanced on someone's nose.

Robot Servants

⁸ A tale called 'The Automatic Maid-of-All-Work' was written back in 1893, featuring a battery-powered mechanical maid who would perform mundane household tasks – and that dream of offloading the drudgery of washing, cleaning and video programming to a device that has no feelings and doesn't actually mind skivvying is one that perpetually lingers in our minds.

⁹ Their arrival in the average home is regularly and wrongly predicted, and short of a few automatic machines that vacuum the carpet or mow the lawn by a process of trial and error, there's not many on the market. The Japanese are at the forefront of developments; the Wakamaru is a cute, yellow robot designed primarily to provide company for the elderly, and Honda's Asimo robot was *launched* last year – although you can't help feeling when watching ... [the promotional] video that it's actually about to fall over, repeatedly shouting 'malfunction'.

¹⁰ The Holy Grail, for some reason, is to develop a robot that's as humanlike as possible; the New Scientist recently reported on a

new skin-like material made from rubber and carbon nano-tubes that will supposedly envelop robots of the future.

Rocket boots

¹¹ The huge *striding* power of the mythical 'seven-league boots' (or 25-mile boots, in new money) were often referred to in European folklore, and make an appearance in Terry Pratchett's Discworld novels. Pratchett noted that the huge distances between steps cause appalling stress on the groin, but there are a couple of modern devices that do enable us to walk or run at superhuman speeds.

¹² 'Powerbocking' is the name given to the practice of *leaping about* on spring-loaded devices called, variously, Powerstriders, Kangaroo Boots and Velocity Stilts. But it's Russian inventor Viktor Gordeyev's creation, the Quickwalker Boots, which *take the gold medal* – not least because each boot has a small combustion engine powered by diesel fuel. Attempt to watch [the] video of them in action ... without giggling; it's hard to believe they were originally intended for use by the Russian army. Unless the plan was to gently amuse the enemy to death.

Videophones

¹³ Face-to-face communication by some kind of video link has been a mainstay of science fiction films for as long as the genre has existed. But when the technology finally ➡

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➡ became available to the public in the US in 1970 with AT&T's Picturephone, the lukewarm response – only 500 subscribers nationwide at its peak – shocked the industry. The slow *take-up* might well have been down to the hefty \$90 (£48) per month subscription fee, but more fundamental was the realisation that the idea of video calls is more attractive than the reality; they don't offer much more value than standard calls. AT&T had another go with the VideoPhone in the early 1990s, but again, the \$1,500 (£810) price tag didn't *get customers flocking*.

¹⁴ Today, most modern smartphones have the ability to make video calls, but once you've got over the Blade Runner-style thrill, most people revert to the cheaper option.

Tractor beam

¹⁵ Sci-fi geeks love tractor beams. Despite the fact that they're a

fictitious method of using a beam of light either to immobilise or to move an object, one Star Trek fan page goes into great detail about their powers: 'In 2372,' it reads, 'Lieutenant Commander Worf of the USS Defiant suggested using a carefully modulated tractor beam against a Vor'cha-class attack cruiser. It *deflected* some of the vessel's disruptor fire and reduced its effectiveness by 50 per cent.' But the development of the microscopic equivalent of tractor beams – known as optical tweezers – has allowed lasers to be used to pick up and move around individual cells.

¹⁶ [The promotional] video ... shows 'DNA knitting' using this technique at VU University, Amsterdam, and recent work at MIT has used similar methods to build structures on the surface of microchips. Long term, this could lead to the development of disease detectors, or biological interfaces with electronics.

Food pills

¹⁷ While the vast majority of sci-fi lifestyle predictions focus on the boons offered by futuristic technology, there's the odd one that acknowledges that tomorrow's world might not be all hover boards and unisex jumpsuits. Food pills are one of the grimmer examples; mass-produced, pre-packaged lumps in a variety of different hues that would be the inevitable consequence of the overpopulation of the planet.

¹⁸ While one could argue about the nutritional merit of microwave meals, they *don't approach the horror* of the vile wafers made from human corpses that formed the basis of the 1973 film *Soylent Green*. The nearest we've come to food pills in reality, fortunately, is in the form of energy bars, and the compressed nutritional packs that are devised for astronauts and soldiers – a range of joyless, unappetising meal replacements. 'Mmm. How's your nutrient patch, Steve?' ■