Reality check

Whatever happened to virtual reality, that new and promising technology from the 1980s? Dave Howell charts its history and development and looks at what VR is doing today

Have sex with a partner who's on a different continent, explore remote places without leaving your armchair, play games that make you part of the action – all promises made on behalf of virtual reality since the 1960s. VR today aims to duplicate real-world experiences in an artificial environment, usually created and controlled on-the-fly by a computer. It tries to fool the human senses into believing that the virtual world is real. But the idea isn't new: Smell-O-Vision and 3D movies all attempted to recreate aspects of reality.

The golden age of VR development was the 1980s, when pioneering companies such as VPL (see interview with Jaron Lanier on page 104) built many of the prototypes and systems that are still used today. It has fallen from public consciousness in the past decade but is still here today, invisibly supporting major industries such as car design and oil prospecting.

For the rest of us, small-scale VR applications are available from companies such as Inition (www.inition.co.uk) which stocks the Cy-Visor – although the basic model will set you back £750. This headmounted display can be used to play 3D games or to view DVDs on a 45in virtual screen and was recently used in a Renault Clio TV ad. Inition also supplies the Virtual Research 8 headmounted display that is more akin to traditional VR headgear. Its two active matrix LCDs give bright, colourful, CRT-quality images.

For a complete catalogue of hardware, visit www.vrealities.com which supplies headmounted displays and much more besides for the garage VR fanatic. And if you think you are handy with a soldering iron then visit Kevin Mellott's home page (www.geocities.com/mellott124), which has details of a wide variety of DIY VR projects.

Sites for sore eyes

Viewing web pages in a VR environment is also possible thanks to VRML (virtual reality modeling language), a specialised form of HTML. This can be used to build 3D websites that act like VR environments – you can move around in them with an avatar that represents you. While sites such as the Habbo Hotel (www.habbohotel.com) offer an immersive environment in 2D, VRML allows you to build a 3D website.

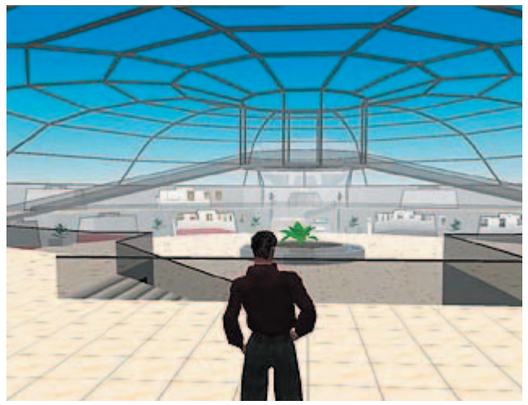
There are some excellent examples of sites that make full use of VRML. One of the best is ArtFair, shown right (www.artifair.nl), a virtual art gallery you can visit from your desktop. If you would like to generate an environment like the one pictured then visit Sense8 (www.sense8.com) – which has all the tools you need to create professional 3D websites.

For a more affordable option, ActiveWorlds (www.activeworlds.com) offers a complete package that allows you to construct your own 3D environments. And with Adobe Atmosphere (www.adobe.com/products/atmosphere) you can build communities within 3D worlds.

Play the game

Today's gaming titles make excellent use of 3D graphics, pushing realism to the limit. Truly virtual games that allow you to interact in an immersive environment have long been promised and will perhaps be our first taste of mass-market VR. Using a headmounted display to play 3D titles such as first-person shooters certainly brings you closer to the action.

If you're into such gaming and want details about which titles make the best use of VR hardware, take a look at the Straylight site at www.strayvr.com.



One of the most cost-effective ways of experiencing VR gaming is to get your mitts on a pair of so-called 3D shutter glasses. Although not headmounted displays in the truest sense, these spectacles make the images in specialised titles seem as though you are looking at a 3D image. Check out eDimensional (www.edimensional.com) for details.

Let's get non-physical

Cybersex, as its name suggests, allows you to get intimate with a partner via your computer. The primary hardware is a neoprene jumpsuit that has strategically placed electrodes for stimulating areas of your body. Once you don the suit, your partner can see a graphical representation of your figure and uses their mouse to instigate sensation. Welcome to the world of teledildonics.

It's been called the future of sex: no more unwanted pregnancies, risk of disease or embarrassing mornings after. Vivid Entertainment, the creator of the cybersex suit, is keen to point out that the device is still in development. Before this technology becomes commonplace, the general public will need reassuring that it is safe to attach electrodes to your privates and hand over control to a remote partner.

But the suit is finding favour among fetishists who can't wait to get their hands on this 'wear-ware'. "It may bring you to full orgasm; it may not. It's not about that. It's more about playing with your partner," says Lisa, who served as a test subject for the cybersex suit.

The idea of being able to manipulate a device from a distance isn't a new one. Admittedly cybersex wasn't top of the list of priorities when the first telepresence system was built in 1958 by the Philco Corporation. The hardware used a headmounted display to control various devices that in turn manipulated objects. In the late 1960s Ivan Sutherland at MIT took this concept a stage further to develop prototypes of the head-up displays that fighter pilots use today.

If the sex industry embraces VR it will give the technology considerable thrust – the VCR, DVD and video streaming on the internet have all been driven by pornography.

Virtual future

There is no doubt that VR technology will continue to develop in areas that reap an immediate benefit. We have already seen the Visible Human project (http://visiblehuman.epfl.ch); its data can be used to create stunningly accurate illustrations of every part of the body for medical training. And the Virtual Reality Medical Center (www.vrphobia.com) uses VR technology to help people combat their phobias.

Meet and greet: Jaron Lanier

Jaron Lanier, who started in the computer business as a programmer, is often referred to as the father of virtual reality and was the first to coin the phrase. VPL, the company he formed in 1983 and was ousted from a decade later, is credited with developing prototypes of many of the VR systems that are used today. Still sought after as a computer guru and public speaker, Lanier is also an accomplished professional musician.

Where does your interest in VR come from?

I grew up in an impoverished, rural society but among an elite population of technicians who worked in the labs of nearby research centres. The New Mexico State University had one of the better early computer science departments. I just happened to grow up next to it and it was welcoming to me as a weird and eccentric kid.

When I was about 11 I made a haunted house for Halloween. A young soldier stationed at nearby Fort Bliss, the world's largest military base, taught me the basics of electronics. So I used Theremin devices that react to movements in the air around them, hooked these up to junk TV sets and got the devices to display psychedelic images on their screens.

How did your company, VPL, come into existence?

In 1982 I was a freelance video games programmer and researcher at Atari Labs. I had one game called Moondust that became a hit and was the first interactive music title. This was the first time that I had any money so I got some friends together and we started to build virtual reality machines in my garage.

In 1983 our work was written about in *Scientific America* and we got some calls from venture capital people. Our garage business then turned into this company at the insistence of the investors. VPL – as it became known – introduced the first VR products to the market.

What I think is more important, however, is that we built the prototypes for all the major VR applications that have become commonplace. For instance, we built the first automobile design application, the first oil field visualisation and the first surgical simulation. Unfortunately the company never really had management. I left VPL in the early 1990s. It continued for a while and finally ended up with Sun Microsystems.

Why are we not seeing mass-market VR products?

One reason is the high cost of developing and then bringing a VR product to market. There are also all sorts of health considerations about the effects of VR. But if there's one area in which VR should be developed as soon as possible it's in education. VR allows the student to learn within an environment in which they feel comfortable, so learning becomes easier.

VR may not be in the home right now but without VR systems no new car would have been built over the last few years. It may be some time before VR enters the home in the same way that the mobile phone or DVD player has, but once costs are lower and we figure out what we can do with this technology then VR will become as ubiquitous as the mobile is now.

left: the VR Media Lab experimented with Cave technology to produce a VR experience that doesn't require a headmounted display. An entire room is turned into the immersive environment

below: the Marshall Space Flight Canter in Huntsville, Alabama began to utilise VR for design analysis in the X-34 experimental reusable space vehicle. Analysts at MSFC's Computer Applications and Virtual Environments used headmounted displays, spatial trackers and gesture inputs as a means to animate or inhabit a properly sized virtual human model

Tracking the history

The development of VR systems can be traced back to the 1950s, when computing pioneers such as Douglas Engelbart and Ivan Sutherland produced the first research into the graphical capabilities of the computer.

One of the most striking developments of the 1950s came from the artist Morton Heilig, who described what he called his 'reality machine'. He surmised that if he could control what his audiences' senses were receiving he could give them the illusion of 'being there'.

Using 3D films and Cinerama with its massive wraparound screens, Heilig wanted to create an 'experience theatre'. He built a device in 1962 that he called the Sensorama (http://retrofuture.com/sensorama.html) which offered its users a fully immersive experience.

The film industry was among the first to see how VR could be applied. The 1970s saw a boom in special-effects-driven movies thanks to the success of *Star Wars* in 1976, while VR itself was the subject of *Lawnmower Man* in 1992.

Do-it-yourself VR

In the 1970s and 1980s, US universities and computer companies ploughed millions of dollars into speculative VR research. But outside the well-equipped labs and research establishments, individual inventors and enthusiasts worked from their garages and spare bedrooms to turn science fiction into virtual reality.

Foremost of these individuals was Jaron Lanier (see the interview on the facing page, the man credited with coining the phrase 'virtual reality'. Having attracted the interest of science writers and venture capitalists, Lanier formed VPL, the company responsible for products such as headmounted displays, the EyePhone and the DataGlove – this allows the wearer to manipulate objects in a virtual environment using hand gestures.

Mattel (www.mattel.com) developed the DataGlove concept, producing its own PowerGlove – one of the most successful mass-market implementations of VR technology to date.

At the moment domestic VR applications are non-existent. We don't have the option of watching TV or using the internet as a fully immersive experience. But VR technology is being used by some of the world's largest companies, helping them to visualise future products and manufacturing processes. For example, architects use VR to allow clients to walk through a building that hasn't yet been constructed. And in the medical world, VR is giving unprecedented access to the inner workings of the human body.

Meet and greet: Roger Frampton

Roger Frampton's VR credentials go back to the mid-1970s when he worked for flight simulation firm Redifon. He has held VR advisory posts at the DTI and the European Commission and is a regular public speaker and published author on IT issues. Currently he is senior partner of Cyber-Wizard, which promotes the adoption of VR and interactive 3D applications through the VREfresh electronic newsletter, VREfresh.com.

Where is the major thrust of research in VR technology?

Early VR adopters are the companies who realise the biggest financial benefits on a short timescale: oil and gas, aerospace, automotive. It's the same industries that were early to embrace mainstream computing and the advantages that it brought.

In academic establishments there is much work being conducted in areas that will bring social benefits such as surgery and visualisation of complex data sets.

VR technology was in vogue for a few years but has now disappeared from the public consciousness. Why is this?

I'm not sure VR was ever in vogue, although it's true to say that it has a lower profile now than five years ago. But that's because 'virtual reality' did not accurately describe the commercial fields of visualisation and training that VR, or rather the interactive 3D applications that users adopted, could provide.

VR has a considerable reputation in the entertainment field, but imagine being the IT manager of a serious company and asking your board to fund what is perceived as a multimillion dollar fun factory? We have now reached the point where working with 3D is a serious business and not just an enjoyable experiment.

When do you think we will see fully immersive VR used in the entertainment industry?

This begs a definition of 'immersive'. If you are in a room totally separated from the 'real' world, that's immersive. In my book, wearing a headmounted display or special spectacles is partially immersive. The latter requires less investment and is more portable. I'm sure IBM, Sun, HP, SGI et al would argue that we have the computing power necessary for immersive VR and Intel is happy to show what is possible with PC processors. An increasing number of VR systems are configured using multiple networked PCs.

As to when immersive VR will be used in the entertainment industry, there are many examples in existence now. And then there's the edutainment arena: museums and visitor centres are at the forefront of providing realistic experiences of our culture, heritage and history.

VR today seems to be concentrated in areas such as medical imaging. Do you think that VR will be confined to these niches?

Medical imaging is a good example of how VR is being used now, but it is only one example. Many VR applications allow people to experience environments that would be too dangerous, too expensive or impossible to create in the real world: divers training to construct underwater oil platforms, manufacturers designing safer cars, astronauts training for space missions.

In the near future, what do you think we can expect to appear from the VR labs around the world that ordinary people can use?

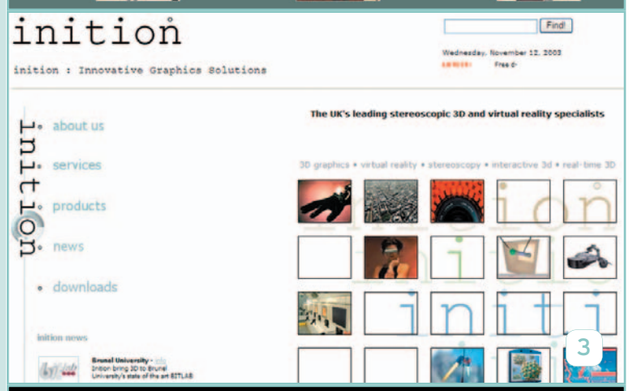
Many of the technologies, techniques and applications of VR/i3D are already being embedded, often unrecognised, in everyday systems. For example, 3D displays on mobile telephones show promise. And we can have artificial smell and even taste to recreate reality. But probably the greatest breakthroughs will be in display and projection technology. It is a fair bet that the first holographic digital representations of real-world objects will be demonstrated by researchers currently working in VR laboratories.

Visualisation is the chief application of VR. You can see examples of this on Maelstrom's site (www.maelstrom.com), a company that produces cutting-edge visualisations for clients as diverse as NatWest and Carlsberg.

But medical visualisation is where VR will have its greatest impact. Computed tomography and magnetic resonance image scanners have done for the examination of soft tissues what x-rays did for bones. But what if you could see an MRI scan in 3D and then, with your hand, manipulate the image? This kind of visualisation is coming to a hospital nearby very soon.

Companies like Immersion (www.immersion.com) and Argus (www.argusvr.com) have the tools that will allow future VR applications to become a reality. The Haptic immersive workstation, for example, can be used to train surgeons or allow astronauts to practise spacecraft manoeuvres before their feet even leave the ground.

VR is all around us. It is used to build the cars we drive, find the oil for the petrol that we buy and train the next generation of doctors and surgeons. From humble beginnings, VR technology is now one of the most exciting areas of computer development.



Virtual surfing

Whether you want to have a go at building your own VR kit, take a wander around a virtual-reality art gallery or just find out more information, we bring you the best sites around.

1 Activeworlds.com

One of the most easy-to-use and powerful 3D virtual reality environment building platforms. Build your own world and invite people to join you there.

2 Artifair.nl

See how virtual worlds can be put to practical use. This is a virtual art gallery that you can walk around and view the works on display. Artists can add their own virtual exhibitions to the VR space.

3 Inition.co.uk

The UK's leading supplier of VR equipment. If you're looking for headmounted displays, 3D input devices or haptic feedback kit, this is the place to shop.

4 Argusvr.com

See what the cutting edge of real-world VR looks like. The site provides hardware and software as well as complete immersive VR systems for a wide variety of clients.

5 DIY VR with Kevin Mellott

If you want to get your soldering iron out and try your hand at building your own custom VR kit then Kevin Mellott has a number of detailed projects on his website for you to try. Log on to www.geocities.com/mellott124.