



## Ian Hughes/Epredator - Flush Magazine Portfolio Issues 1- 15



<http://www.flushthefashion.com/flush-magazine/>



<http://www.feedingedge.co.uk>

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Articles written for Flush the Fashion May 2012-Dec2014

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# VIRTUAL WORLDS

## Very real and very now

The original Metaverse Evangelist and Tech Guru,  
**Ian 'Epredator Hughes'** presents a guide to the next  
generation of virtual worlds

### So what are these virtual worlds?

The term **Virtual World** is often applied to the many ways people interact online. In a modern connected world where people are only just coming to terms with talking to friends and family online on social media sites like **Facebook** and **Twitter**, it's worth casting an eye towards the richer, and direct experience that visual virtual worlds bring. These days there are more virtual worlds than ever before.

The amount of interaction each world can offer differs. Some virtual worlds are aimed mostly at kids. These worlds allow kids to express their style through customising their home and their character. Others allow directed text chat (choosing phrases from a menu), up to full text chat. Safety is an important factor for parents, and these worlds are carefully monitored and strict language filters are used to prevent the obvious potential dangers of talking to strangers. For the younger audience it is fairly typical for the character they use when signed in to be regarded as a pet.





There are many different activities to do, special missions, mini games and even tending gardens. The activities generate an 'in world' currency that can then be spent on even more customisation.

## Decorate

All these environments allow customisation, generally decorative customisation. Your character gets new clothes and toys, your home gets new gadgets and wall paper. There are ways to show off how many games you have played and the level you have reached.

The worlds thrive on discoverable secrets and achievements. These achievements create a buzz that encourages communication, talking about them at school or with friends. **For kids to get the full immersive experience in these worlds costs around £5 per month.**

The next generation know what's what. Our kids are already learning to expect a more dynamic way of connecting online through virtual environments. They are experiencing online worlds that are specifically built for them. When they grow past those environments where do they go next?

## Show Me

Many of these virtual worlds do not come from traditional games developers, nor from a traditional media organisation.

New ones spring up almost daily, but two UK startup companies that have gained huge popularity recently are Bin Weevils and Moshi Monsters.

### Bin Weevils

In Bin Weevils you play word and number games to gain Mulch to customise your bin and your Weevil. It's possible to visit a friend's home and share that space and live with them. It's also possible to set up a small business, such as a custom photo booth for other Weevils to pop along and have their own in-world photo captured in a scene set by you.

### Moshi Monsters

Moshi Monsters has gone from strength to strength over the past few years and moved from purely online to lots of other media including toys and a recent album. Here you adopt a Moshi Monster, then earn Rox through games and experiences. The initial games were brain challenges, but now include lots more traditional arcade type games themed for Moshi.

The virtual world is a social conduit as well as a social subject, and as there is no final objective play becomes open ended.







# VIRTUAL WORLDS

## Not Talking Orc?

Online gaming has become a major part of the traditional games industry. Highly crafted environments allow both gaming and social activity to happen. These experiences are generally produced and themed. **Word Of Warcraft**, **Eve Online** and **Star Wars – The Old Republic** are all examples where groups of people can gather, organise and take on the challenges of the environment.

Generally they feature character growth. The more you play the stronger you get and the better the items you can use. They are virtual worlds too, but not what we are looking at here. Neither has the cut and thrust of first person shooters such as **Modern Warfare 3** and **Battlefield 3**, although these have their place, and create rich communities.

## The Generation Game

Instead, let's consider USER generated virtual worlds. These worlds are as much about the tools to create the contents of the environment as they are about the interaction of the users. Virtual goods and an economy feature strongly.

It is usually at this point people say, "Oh you mean **Second Life**? is that still going?". Well for the record, Second Life is still going (look for me, Epredator Potato) , and has a passionate set of residents. Lots has been written and talked about what Second Life is and

does, but it is not the only example of worlds created by their users. For those who want a commercially run virtual environment and place to see what it is all about it is still one of the best places to go and explore.

However it has spawned something even more intriguing: an open source project OpenSimulator.org a.k.a. Opensim.

Like all open source projects

**OpenSimulator** is a publicly available set of resources and is now starting to spawn other commercial and social activity.

As it is 'open source', you can grab the server code and run it wherever you want. Local virtual worlds, private servers, stand alone cloud based servers or join with all the other publicly run servers and join the Hypergrid.

Or you can access a service like Kitley that aims to provide an on-demand service on top of **Opensim**.

With this sort of virtual world anything can change anywhere at anytime. That sounds chaotic and yes it can be. Alternatively it can be considered a giant immersive 3d wiki.

You can see other people's avatars and they can see you. You can communicate, talk and build together, immersed in the ideas. These worlds provide space to both work and play, and are breeding grounds for knowledge sharing and friendship building.

[www.moshimonsters.com](http://www.moshimonsters.com)  
[www.binweevils.com](http://www.binweevils.com)  
[www.minecraft.net/](http://www.minecraft.net/)  
[www.secondlife.com](http://www.secondlife.com)  
[www.opensimulator.org](http://www.opensimulator.org)  
[www.kitley.com](http://www.kitley.com)



## Learning your craft

Opensim may seem a major leap from kids customising their adopted pets and playing mini games. However there is a current hybrid virtual world, spawned out of indie gaming, released as an ongoing beta (also just released for Xbox live) and now a major force in gaming.

### Minecraft

It's easy to be fooled by the retro 8bit look to the graphics but Minecraft is a game. Enter the world with nothing and try and survive.

The key to survival; collect resources from the randomly generated world around you and combine them (craft) into new items. For example, you can chop down a tree and use the wood to make a door.

Everything in the world can be picked up or mined, formed and built with. As a single player game it becomes a freeform building and digging experience, digging deep mines to find coal and precious ore whilst building defences from the creatures of the night.

Minecraft really changes when it

becomes multiplayer. As with Opensim it is possible to download the server code to run anywhere you choose. The server then provides a persistent world that groups of people can connect too.

Here they can compete or co-operate, play or just build like a giant lego set. For those not used to working together online, both kids and adults alike, the environment is a sandbox to figure out how to work together.

A 'creative' mode removes the pure game element of competing against bad guys and allows people to just build. A Youtube search of Minecraft will show an ever growing set of videos of people showing what they can build, or machines they have crafted and making pop video parodies. The worlds created on the server can also be saved and exported and shared online. So the environment becomes a virtual good itself.

You may think building in 3d is tricky and too much to handle. However, if you've seen a five year old move around effortlessly and create a massive structure in minutes you will appreciate the future of communication online really is through virtual worlds like this.

Virtual worlds can be thought of as an experience or a game, but when you treat them as an expressive toolset they can become very powerful.

**Something that is unique to the internet and leads to *another* exciting future crossing the boundaries of the virtual and physical...**

Ian is part of the 'Cool Stuff Collective' on ITV and on twitter @epredator  
The future can be found on his website  
[www.feedingedge.co.uk](http://www.feedingedge.co.uk)





# 3D PRINTING

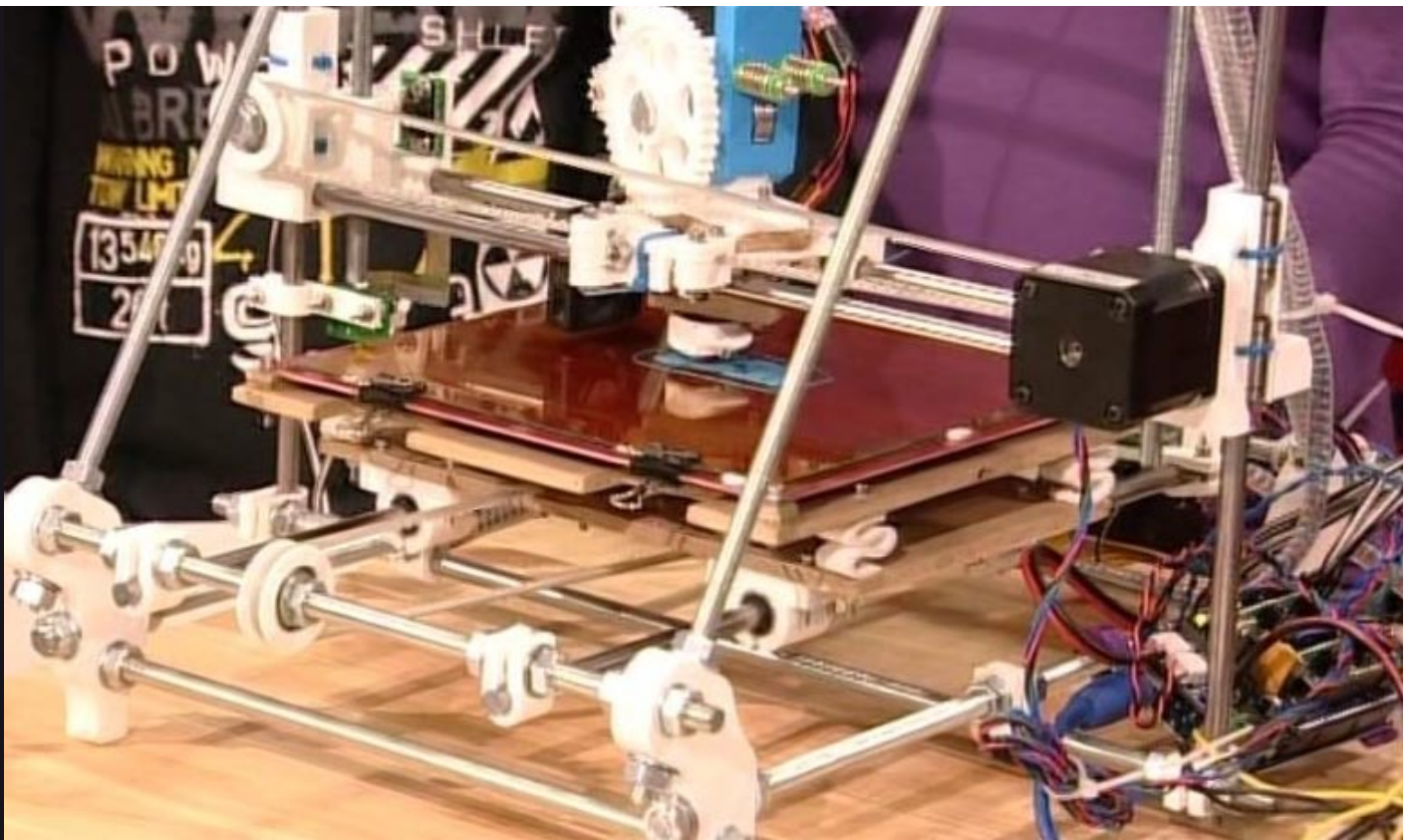
VIRTUAL GOODS IN  
THE REAL WORLD  
**IAN HUGHES/EPREDATOR**

## **MY SHORT HISTORY OF 3D PRINTING**

Back in 1998 I became aware of a very expensive manufacturing technology called Rapid Prototyping.

It was used by product designers to take a digital design and create an actual physical model. It cost in excess of \$250,000 at the time, but for me it offered a glimpse into an exciting future, but one that also seemed like an age away.





# 3D PRINTING

Just a few years later I saw a 3d printer advertised for a (mere) \$29,000 and sent off for a sample. A small little tub arrived, with a slight geometric twist to it and with a screw top lid. It became a bit of a talisman for me to carry around, to show people the future was already here.

Helping people come to terms with the impact of what appears to be science fiction technology on their lives is what I do. So explaining 3D printing combined with virtual worlds is a common occurrence for me and follows a similar pattern each time.

I was more than happy that this was one of the first things we covered on The Cool Stuff Collective kids ITV show, and I made sure it features in my TV Showreels too [www.feedingedge.co.uk/blog/tv-showreel/](http://www.feedingedge.co.uk/blog/tv-showreel/)

## PLEASE EXPLAIN?

We tend to call Rapid Fabrication (or Rapid Prototyping) 3D printing now, but that can be a slightly confusing term. It's not what you might think i.e. printing a picture and making

it work with 3D glasses. 3D Printing it is to take a purely digital model and create it from physical material - in real life.

There are lots of different ways to do this, but the most common is one that moves the equivalent of an icing bag full of melted plastic around over a flat surface, leaving a thin trail of plastic to create a layer of the object. Then as that sets the next layer is created. The more precise the movement, the higher quality the material, the better the completed object. It's like making clay pots at school from long snakes of clay, with each layer adding shape.

## THAT'S GREAT BUT IS THERE MORE?

Once you get over the technology concept and the mechanics of making something virtual become physical, then you can start to see into the future and how this fits in with the other changes we've had in both technology and our social structures.

When I first saw the printers they were used by individual designers in large companies. The design package was attached directly to the printer. It was used in a very enclosed loop. Now we have the ability to share ideas anywhere in the world online across the internet.

Just consider that. Anyone can create a digital design anywhere, and anyone with a 3d printer, anywhere in the world can receive, design and create a physical object from it.

That would be exciting enough but there is more. Just leaving a digital design file on a website for downloading is only the start.





They are designed by a company, mass produced in a factory, which for economic reasons is in a developing country. All the products are then packaged up in more plastic and shrink wrap and then shipped around the world. They are stored in warehouses and shops until we take them home and throw the packaging away to play with the toy, or cover our latest smartphone.

Now though, I can log into a virtual environment, have a look around, talk to the designers and even use the virtual version of a product for a while online. If I like it I could just print it out at home when I need the 'real' thing.

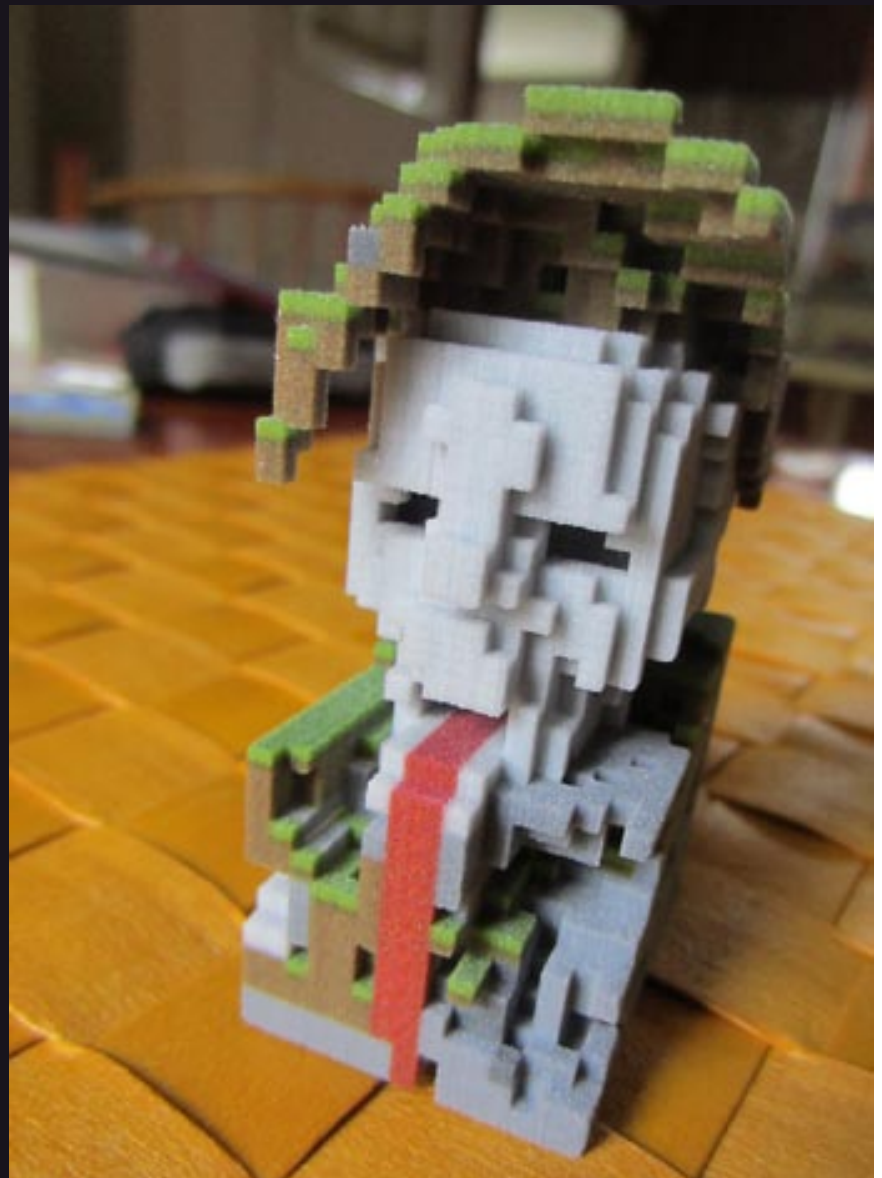
There is no packaging, no wasted products or inventory, just my local raw materials. Obscure products can live on, just as back catalogue music is readily available. The Long Tail is arriving for physical goods.

As I wrote in the last issue we have some amazing user created virtual worlds and games platforms, which are in themselves live realtime globally shared 3d modelling tools.

The objects that people make are being digitally distributed, sometimes sold, sometimes shared. They are virtual goods that can be used and experienced online. Except now, they can also become physical goods with a 3d printer.

## DOESN'T THAT CHANGE THE ENTIRE ECONOMY OF THE PLANET?

Why yes it does (or it could). Take your average plastic toy, or mobile phone case.





# 3D PRINTING

## IT'S A WAY OFF THOUGH ISN'T IT?

No! It is already here! There are a number of interesting directions and like the industrial and digital revolutions before it there is not a perfect blueprint. Equally, like those revolutions this is not going to stop.

Owning a 3D printer may seem an expensive proposition. However in the wonderful open source world of the web there is a project called RepRap [www.reprap.org](http://www.reprap.org). This is a shared and constantly evolving design for a home made 3D printer. At its core is that the pieces of the RepRap printer can be printed out (manufactured) by another RepRap printer. It makes hardware viral. If I have a printer, I can make my friend one.

There are a number of groups of people that have been seeding this idea. I joined in with Malcolm Napier and the Thames Valley RepRap User Group <http://tvrrug.org.uk/> where about 20 of us now have the parts and are in the process of building our printers. The cost works out to about £400. This is of course a homebrew Maker Culture approach. The size of what can be printed and the material used becomes a tweaking

and sharing hobby, but it is very real.

There are other kit variants of printers along similar lines for around £1000, and then more traditional machines that companies like HP produce. It doesn't mean every home needs to have one, but they can if they want.

Not owning a 3D printer is not an obstacle either. 3D print shops and centralized locations to print already exist too. Shapeways [www.shapeways.com](http://www.shapeways.com) is a company that you send your designs to, or share on their store. They print out your objects for you. They offer a number of small design wizard tools to allow the customisation of objects too. The benefit of a slightly more traditional centralised manufacturing is they can offer lots of different types of printout material from light plastic to strong metal. The high end fabricators can make very precise and detailed moving parts and combinations of multiple materials. It is certainly not all just brittle plastic.

New business ideas have sprung up based on using 3D Printers. June 2012 saw the alpha launch of Makies [www.makie.com](http://www.makie.com).







LEFT: BEETLES  
DESIGNED BY  
MICHAEL MUELLER  
AND PRINTED BY  
SHAPEWAYS



ABOVE: RASPBERRY  
PI CASE BY MICHAEL  
GARCIA FROM  
SHAPEWAYS

**me.** Based in London they have an action figure that is 3D printed to your specification. The online wizard allows you to alter the facial features, then pick some clothes.

Very shortly afterwards your very own Makie arrives. Being a fan of 3D printing I got in on the first 100 ever made (number 31). The design is also very clever in that the head is hollow and has been created to take a lilypad arduino board. That's open source hardware in a doll. Which means lots of Hackers and Makers will be exploring what to do with them. In the future they will come with the option to be loaded with these sort of things and to be connected, (probably with their own Twitter accounts).

We don't all have to be 3D designers or



LEFT: ARROWHEAD  
RING BY FATHOM &  
FORM PRINTED BY  
SHAPEWAYS

printer engineers, but we can use the things that are already there to combine to create an interesting future.

Just as a final example, back in 2006 one of my Second Life avatars, one that I had added a digital version of my real leather jacket and wearing custom Reebok trainers that were all the virtual rage, was printed out by Fabjectory - in colour. So my jacket had gone from physical to virtual and back again. I also have a great physical reminder of a specific time and place.

Now in 2012 I am able to take things created by me and my kids on our shared Minecraft server and print them out on my home made open source RepRap using opensource applications like Mineways <http://realtimerendering.com/erich/minecraft/public/mineways/>



# 3D PRINTING

## LET THE KIDS LOOSE ON IT !

Technical education in schools is currently under review. Computer science and how we get kids to write code are being discussed. I am convinced that mixing game environments, shared virtual design tasks and physical manufacturing with 3d printers in schools also has a significant place. Every school should be doing this too. That way we educate resourceful makers who are not constrained by existing boundaries. New, worthwhile and interesting things will spring up from our next generation of Makers. Virtual goods aren't just virtual now.  
Ian Hughes/epredator

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IAN IS PART OF THE 'COOL STUFF COLLECTIVE'  
ON ITV AND ON TWITTER **@EPREDATOR**  
THE FUTURE CAN BE FOUND ON HIS WEBSITE  
**[WWW.FEEDINGEDGE.CO.UK](http://WWW.FEEDINGEDGE.CO.UK)**





**WITH THE LONDON 2012 OLYMPIC GAMES AND PARALYMPICS HAPPENING THE PAST FEW MONTHS HAVE BEEN MASSIVE FOR SPORT. BEHIND THE SCENES ALL THESE EVENTS HAVE FEATURED ELEMENTS OF ELITE SPORTS SCIENCE AND TECHNOLOGY.**

BY IAN HUGHES / EPREDATOR / FEEDING EDGE LTD



# VIRTUAL

# ATHLETE

For example, the marginal gains team for the TeamGB cycling applied a technical focus to the equipment used, and discussions raged regarding the technical advantage (and rules) around the carbon fibre blades used by track legends like 'Blade Runner' Oscar Pistorius.

Such inspiring occasions will inevitably lead to more people trying sports out, and for the home athlete there are some very accessible technology trends that add motivational and even game based features to physical exercise.

It's interesting for me as technology actually led me into a very active pastime, which in turn led me to yet more interesting technology. It may be a journey that other people also realise is worth taking. It also shows the evolution, and removal of many barriers to a rich and healthy life. Oh yes, let's not forget levelling up and scoring points too!

## FLASHBACK

I would never have considered myself overly sporty, no great surprise for a gaming-tech-geek stereotype. I've had moments of applying myself to physical workouts though. Back in the mid 90's I decided my desk

bound office job (constantly programming), was not going to help me enjoy my first skiing holiday. I also knew that going to a gym wasn't going to be the sort of

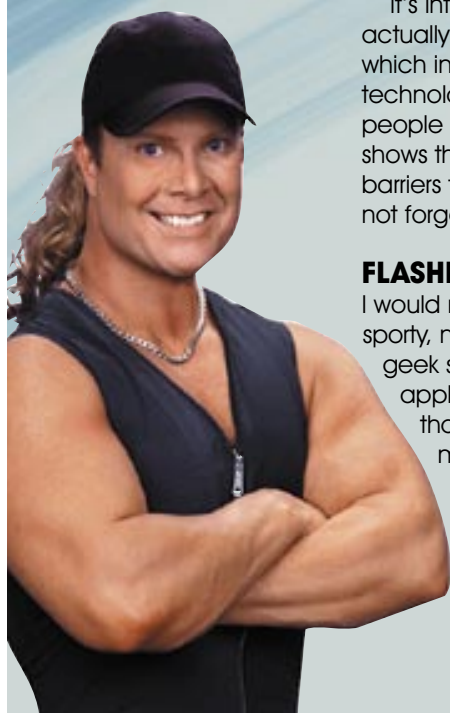
experience that I would particularly enjoy.

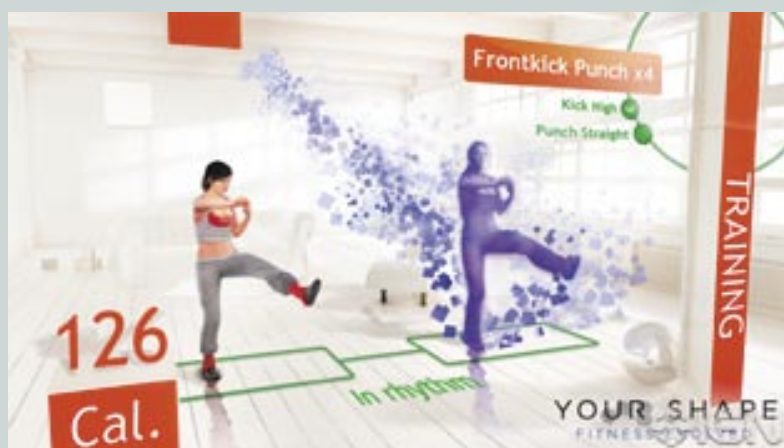
So I got hold of a VHS video tape (google it, if you are under 15) of All-American fitness guru, Tony Little (left) and started following the programme. Being on analogue video tape it was always a bit annoying having to rewind to the right point in the tape each time. The tape gave a reminder of technique, which is important in weight training, but was really a pace counter. A little bar ran across to show you 15, 30 and 45 seconds. Although it lacked variety, it was actually very enjoyable.

It became part of my daily routine. It was very low tech, but it was a start. I also decided to go cycling and this is where the tech involvement started to ramp up. The early web helped me discover a heart rate exercise formula. How could I resist something that would let me use technology when out riding a bike?

The formula (The Karvonen Method) is to measure your resting heart rate, then to calculate your maximum heart rate which is 220 minus your age. This gives you a heart rate range. Within that, percentage bands indicate the sort of affect you are having on your body, and when and where you are either over, or under performing. So I popped into a local shop and purchased a heart rate monitor. This was an elasticated chest band containing the sensor which was paired with an LCD watch that showed the current heart rate.

I didn't stop there. A further addition to





a rock and don't fully appreciate what the Kinect does, it is designed to be plugged into the Xbox 360 home game console. It consists of several sensors, cameras, infrared and audio ones. It is able to recognise a human standing in front of it and determine the location of their arms, legs, body and head in realtime, and also know how far away those points are. So unlike a regular camera this sees in 3D and can process that as data.

It has created many new game genres, generally involving some degree of physical activity from gentle arm waving to full dance moves. When I actually got to use it for real in the studio I couldn't wait to take it home for more serious exercise activity. Things that my previous VHS tape experience did, could be enhanced. Showing a virtual trainer, adjusting in realtime to the actual activity, scoring, counting etc.

When I got my own Kinect I dived straight into Ubisoft's Fitness Evolved. A set of exercises, challenges and goals that adjusted to your abilities (which, when I started were sorely lacking). It can see you doing the moves, give visual feedback and cues about timing, and corrections. You also never have to wait for a tape to rewind! You gain achievements and badges too.

It was fortunate I had spent a few intense weeks getting fitter as suddenly on the TV show I was faced with some tough 'on the road' features to film. I was thrown into indoor skydiving in the morning then indoor snowboarding in the afternoon. Both of which I survived.

Once again though, I lapsed for a few months, however, the seed had been planted. The UFC Personal Trainer for Kinect was released in June 2011. UFC (Ultimate Fighting Championship) is a mixed martial arts full contact fighting event. UFC trainer took some of the traditional gym exercises, and created a very intense set of routines,

the whole tech mix was not a simple speed distance bike computer, but a GPS tracker that measured all sorts of things including elevation. So I hurtled around country

dirtracks maintaining my heart rate at the scientific optimum, whilst logging lots of GPS data. Yet I still did not consider myself sporty!

This was a science project. It helped me a lot with those first skiing holidays, though I found I hated skiing and was not well suited to it mentally. I didn't totally give up though and took to snowboarding instead, which is much better.

The VHS weights routine gradually faded away after a couple of years as work and family life changed. The cycling also became a bit more infrequent.

## BACK TO THE FUTURE - ZOOMING FORWARD NEARER TO NOW

A few years ago I swapped my corporate commute for my own home consulting business. It meant I could adjust my working day and times to fit whatever I needed to do. It took a little while to mentally adjust and realise that it should include some physical activity. I knew I wanted to do something, but I needed to be using some technology so that I could explore the experience and benefits of it whilst also working out. Killing two birds with one stone, so to speak.

Then along came Xbox Kinect. I got early access to it on the second series of The Cool Stuff Collective. In case you have been under





# VIRTUAL ART

but also threw in some more aggressive combat moves, kicks, knees and punches. I had always pondered taking up some form of martial art, and this seemed a good taster. I bought the game, did the first exercise evaluation and realised I was way more overweight and unfit than I had ever been.

I probably already knew this, but now my Xbox was telling me! It was a physical shock to the system. This was certainly not a "game" the routines were a mix of stamina, strength and speed. I stuck with it every morning for over 9 months. No matter how much you do, there is always more. It becomes difficult for anyone to work without a goal. Getting fit can mean a lot of things. I wasn't actually getting bored, but I felt I needed more to focus on.

## THIS IS WHERE VIRTUAL MEETS REAL

In January 2012 I saw a leaflet for a martial art, one that was modern, non competitive and suitable for both adults and kids. This was Choi Kwang Do <http://choikwangdo.com> and in particular South Coast CKD <http://www.southcoastckd.co.uk>. So I went along, with my five year old son and met Sabumnim Webster. I knew that whatever we did I was fit enough, and having practiced punches, kicks and knees for months with UFC Trainer I might have a chance not to feel inadequate.

As it turned out that would not have been an issue as Choi Kwang Do is a martial art that is about self improvement, rather than

aggressive comparisons to fellow students. It is an ever evolving art, it's only 25 years old, not afraid to include new techniques and is very focused on the science, physical and psychological, of self-defence. The school owners and instructors use technology to analyse their own techniques. This includes using video and software originally designed to analyse golf swings.

Given some of the easily accessible technology that got me into the art in the first place this has got me even more interested in what we can do. Now both our kids are enjoying our regular trips to the Dojang

## WALK (OR RUN) THIS WAY

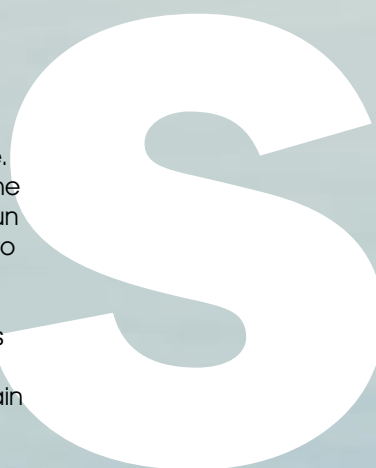
One of the simplest pieces of technology around is the step counter. Step counters have typically been small devices with LCD screens, now however, the step counter has evolved into a much more connected device.

The Nintendo 3DS, as well as being a dedicated handheld gaming system actually counts all your physical activity, as it includes a stepper based on its accelerometers. The motivation for using a stepper is usually only for exercise. Nintendo turn that concept on its head a little. The more steps you do the more coins you get to use in some of the games. This actually encourages you to take the 3DS with you in your pocket, when you would otherwise just leave it at home. Each day when I walk the kids to school I pick up





is the Nike+ training application for Xbox using Kinect. Lots of training and tracking, as with UFC and Fitness Evolved, but with the scoring of the activities as, you guessed it, Nikefuel. Smartphones are loaded with sensors and also tend to have GPS. This has led to some clever developments around exercise and in particular running. Endomondo is used by millions of people worldwide (see our App of the Month) and Zombies, Run! <http://www.zombiesrungame.com> is a story based training app. It uses the principle of knowing how far and fast you run relative to your current position. This is used to trigger story elements and mini challenges for you via your headphones. So rather than just running with some tunes your run is interspersed with narrative. You learn more about the story by running, you reach certain targets in certain times to impact that story.



the 3DS on the way out of the door.

Another interesting move has been by Nike. They've been making trainers with steppers in them. The rise of internet connectivity and social media led to the sharing of individual performance data and activity. Of course people don't wear trainers all the time so they have developed a functional fashion item called the <http://nikeplus.nike.com/plus/products/fuelband>. This active device is worn as a bracelet/watch and tracks all your activity. It has coloured LED indicators scoring you to your target and a matrix display to show time and text. The Fuelband connects to smartphones and computers to send activity, which then hits the social web. The aim is to measure whatever sporting or motion activity occurs. Individuals can set their own targets based on their sport.

An offshoot of the Nike measurement system is the definition of Nikefuel. This is an attempt at a standard measurement of any activity in any sport. After all, steps only apply to running or walking. Nikefuel lets people compare activity with friends across different sports. Really it's just another motivational tool, the psychology of effort is often harder than the actual effort itself. Game elements like Nikefuel, when also shared with like minded friends, give an extra element to focus on.

Nike have not restricted themselves to physical devices though. Coming very soon

### I LIKE TO MOVE IT MOVE IT

At a virtual worlds conference I was introduced to an unusual gaming controller called Blobo [www.bloboshop.com](http://www.bloboshop.com). This small coloured ball is connected via Bluetooth to some mini games on a PC or Mac. The Blobo has accelerometers in it, so it knows what is happening to it. Is it thrown up in the air? Is it spinning? It senses pressure so it can be squeezed. It also, as it turns out, acts as a stepper counter.

The dynamic this brings to a game activity is subtly different from a PS3 Move, Wiimote or Kinect. If you play the basketball game you have to throw the Blobo straight up in the air and catch it again. Real world physics is involved. The controller leaves your hand. My Blobo came from a Finnish company, but I discovered, via some serendipitous crossing of information streams on my blog, the core of it was developed by a company local to me. Quaternion Technology had developed the Blobo. They have another more sports focused product called the BPMPPro <http://www.quaternion-tech.com/quaternion-projects/bpmppro/>.

BPMPPro is a low cost consumer technology



# VIRTUAL ATHLETE

based motion sensor. It is designed to be attached to the body, usually more than one is applied. It then uses precise measurement of acceleration and movement during a technique. When put in context of a particular set of motions it then can use software to feedback to the user the qualitative elements of the move. One example is of a forehand swing with a tennis racquet. The rotation of the body from the hip, the following movement of the arm have BPMPPro sensors and also a sensor can be placed in the racquet. This can be mapped to the ideal torsion model of the human body to maximise the technique. The technology is also aimed at physiotherapy, helping people to perform the right movements at the right pace. As you can see instrumentation and feedback of the data, either for scientific purposes or for fun and motivational reasons is very powerful. Activities are physical, but the data is creating virtual representations.

These representations are starting to be shared, typically as scores. However there is a natural link to virtual worlds and virtual environments. If we are honing a sports technique with someone else or with a group and we can't all be in the same place at the same time, yet we have lots of instrumentation data, then naturally we should use live virtual world technology as part of the mix.

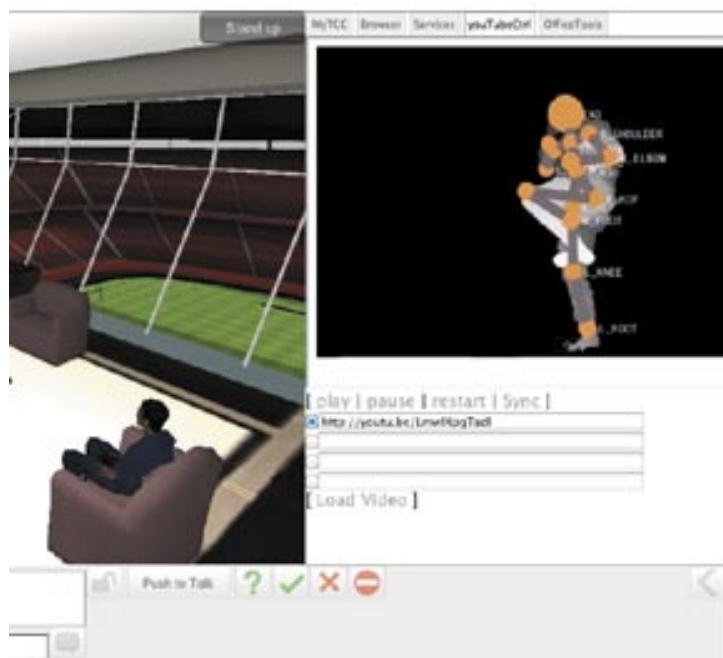
## HEY COACH!

A project well on the road to this sort of interaction is The Coaches Center <http://thecoachescenter.com>. I have been involved in this as an advisor for a while as I think the principles of combining sports and virtual worlds is an ideal platform for people to understand the power of virtual worlds in communication. Sports are games, but not really regarded as games. The technology is game technology, but not really for playing.

The Coaches Center is a Unity3d web based experience. It provides a shared virtual environment. It is initially aimed at sport coach education. All sports coaches at all levels take certain classes and certifications. Often they have to travel and spend time away at shared education sessions. This takes coaches away from their athletes and clubs. If instead the coaches can gather in shared virtual spaces, discuss and participate in the course then more time can be spent on the sport and less on travel.

Once people start to interact online in virtual environments, around a subject they are passionate about (as sports coaches are, many are volunteers!) new models emerge. The Coaches Center provides virtual offices for coaches, they they can personalise and invite people into their office. In the environment it is possible to place posters, videos and information on boards in the rooms. Your avatar can be adorned with





clothes related to your sport. Likewise larger convention centers provide bigger gathering spaces online.

A virtual environment can allow visualisation of data as a shared experience. In the future feeding in of live physical performance data into the environment would let a coach the other side of the world offer their guidance to an athlete. I would let a physiotherapist offer live feedback to someone recuperating at home without the need for travel. None of this removes, or replaces the need to be physical, to meet and work together instead it augments that. It adds a beneficial set of tools to the mix.

For me, going to a Choi Kwang Do session at my Dojang, with the family collaborative atmosphere is important. Training with different people teaches you different things every time. Choi Kwang Do allows for us to go and train at any Dojang anywhere in the world. Imagine if, with advances in easily accessible technology, I am able to get expert human feedback on my techniques from places I can't get to visit physically. Where the data is also able to be analysed to provide some automated feedback too. Measuring acceleration of a punch, counting the number of kicks performed. Each of these can enhance an individuals improvement without making it competitive, yet still have the offer the scoring numbers that something like Nikefuel provides for additional motivation.

## EXPERIMENTATION AND MOVING UPWARDS AND ONWARDS.

This could seem a little way off, but in reality we have all the pieces. I decided to try a little experiment. Initially I tinkered with an Arduino based accelerometer hit counter that could be embedded in a punchbag. Then I decided to try something more advanced. I used the freely available Tryplex toolkit <http://code.google.com/p/tryplex> for the Mac's quartz composer and the Synapse opensource Kinect interface <http://synapsekinect.tumblr.com>. This let me plug my Xbox Kinect into the Mac and try out some Choi Kwang Do moves getting live feedback on the screen, seeing myself as a wireframe with individual joints highlighted. I then fed that (in this case as a youtube video) into my office in The Coaches Centre. I also used the whiteboard to put up some Korean terminology for the moves as text. If you were logged in and invited to my office we would all be able to see the same content, discuss and adjust and swap moves.

At a time when everyone is so inspired by the Olympics and Paralympic heroic sporting endeavours at London 2012. I think it is fair to use the Choi Kwang Do motto. "Pil Seung!" (Certain Victory!) to apply to the benefits this easily accessible technology is going to have on society in the future.

**Roll on Brazil!!**

# A REAL H

BY IAN HUGHES  
**EPREDATOR**





# OLODECK?

Entertainment media these days is all about immersion. We seek to see hear and feel everything about an experience, a story or a game. Much of what we have got used to is based around a single display, combined with our ability to fill in with imagination. With a book that single display screen is the page of text and a whole lot of our ideas added. With a game we have TV monitors, surround sound and some control mechanisms and a little physical feedback. All provide ways to experience a story...



# A REAL HOLODECK?

## READY TO WEAR

Using more screens to get more immersion is complicated and expensive. Screens also used to be cumbersome glass tubes. Now they can now be put into glasses, with a TV screen for each eye. There were a number of these in the early 90's with arcade systems like **Virtuality**. These installations featured a heavy headset and users stood in a pod to help determine where they were facing. The sensors changed what you could see based on head movements. Although the games were not as photo-realistic as today's current state-of-the-art versions, the experience did work.

These sorts of Virtual Reality (VR) helmet experiences are undergoing a bit of a renaissance with companies like Sony building new headsets and the Kickstarter project **Oculus Rift**. It was successfully crowd-funded and support by some of the leading lights in the games industry has been good.

These are headsets you wear that replace your view of the world with a stereoscopic image. Note these can also be considered in the context of the new Google glasses. They are not actually VR glasses but a heads up see through display system. They are screens that you wear.

Of course needing to wear different headsets for different reasons may cause a few problems in user take up.



## ENGAGE...

VR headsets are an approach to create an all around immersive experience. To become totally involved in a 'virtual' environment has long been in the realms of science fiction.

The Star Trek - Next Generation holodeck being a prime example. For those who are not trekkers/trekkies the holodeck was a large room, usually onboard a ship. When in the holodeck an entire world and experience was projected around you. A world of any size can appear. Being in the realms of science fiction it is also populated with objects that are replicated from matter and have force fields around those projections. This means you can walk and bump into things. The floor moves with the users in a hidden multi-directional treadmill way. This can of course seem a little far fetched as a whole. Star Trek is full of subtle pieces of information to help explain how a holodeck might work, but mostly it is a plot vehicle to explore all sorts of places and times. It has become a well know concept.

Interestingly (according to legend) the concept of the Holodeck was put to Gene Rodenberry, the creator of Star Trek by Gene Dolgoff who was the inventor of the LCD projector in 1984.

## LIVING IN A CAVE

Projectors have been used to create immersive environments in research and education establishments. The principle of a CAVE (Cave Automatic Virtual Environment) uses each of the walls of a large cube room as a projection surface for a rear facing projectors. The floor and walls are projected in synch with one another to create the feeling of space and allow some movement. Some variants use 3D glasses too. The room is a known size with flat surfaces making it easier in many ways to create the projections. Moving in the space is of course limited.

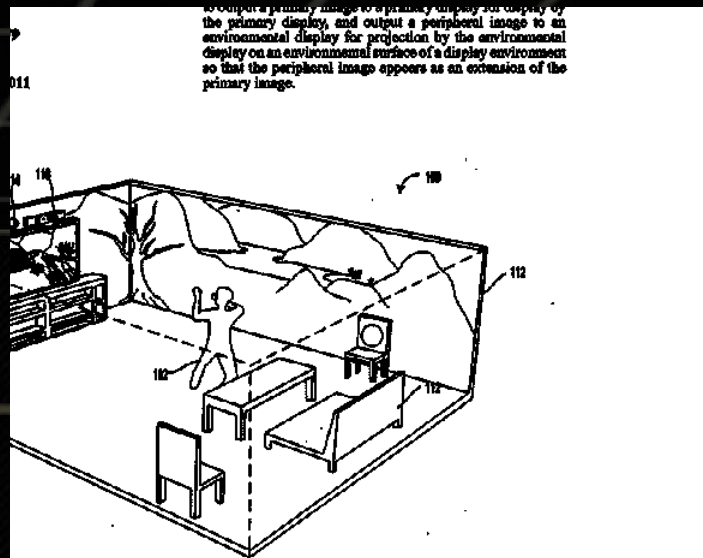
## PATENTS MAKE PRIZES

A recent patent application from Microsoft has pulled together some ideas and concepts that may show a step towards a home projected environment. Patent applications, it should be noted, are an interesting part of the technology landscape. They are often used as weapons by companies to stop or slow down opposing companies (hence the recent Apple v Samsung encounter). They are frequently regarded as anti-competitive. However they are an interesting way to share and express ideas.

It would be hypocritical of me to say anything too negative about patents as I created a few unusual ones during my corporate life, usually around unusual ideas and combinations of technology. I also have a current one pending for an unusual approach to social media and gaming. When a patent idea is put forward it quickly gets massaged by legal teams and often removes some of the normal descriptions that we might ordinarily use, though you can get used to reading what it should be.

The Microsoft patent at face value looks like a simple projection into the room from a games console. It has, though, evolved from some specific existing inventions that we have already got used to in gaming.

To project onto a flat surface, even at an angle is a normal task for a projector. Keystoneing allows a projected image to be tapered or fattened to allow a square image to be projected onto a non squared surface, or at an angle. If you look around at any living room where an Xbox lives though you will see all sorts of surfaces and angles that makes projecting complicated. If the projector can understand the shape of a room and the details within it the projector



can adjust the image to fit it into the room. A complicated and angled surface can be made to look flat. The texture and colour of the existing surfaces will need different intensities of projected light in order to make any image work. We have seen in the last few years some high profile outdoor projections on the facades of buildings that use this principle. The Queen's jubilee celebrations featured a projection of Madness's 'Our House' on Buckingham Palace whilst the band played from the roof.



There is a wall there! Usually motion through the environment is via joystick or gesture movements.

**Wouldn't it be great to be able to project any environment into any other environment like our own homes? It would be interesting to make the entire room the place for our experience. Even more importantly it would be un-encumbered by devices, just walk in and you are there. Just like the Holodeck.**



# A REAL HOLODECK?

## I CAN DO THAT!

How can we do this in our own palaces?

What does a Kinect sensor actually do?

It builds a 3d map of the room it is in, determines where people are in the room and provides that sensor data to the games console.

So you have a scanner that understands you and your room geometry. It makes sense to create a projector to deliver out into that room, adjusting at each surface and corner. Or in patent terms "instructions to compensate for topography of the environmental surface described by the depth information so that the peripheral image appears as a geometrically distortion-corrected extension of the primary image"!

The patent also deals with the idea of not projecting onto the person in the room. If you stand in front of a projector you get glare from the image and anything that should be background and behind you appears on you. The Kinect style sensing will work out where not to project. (Of course knowing where you are may well allow games to be developed that project onto us, uniforms and insignia, equipment, scales etc)

The patent refers to the projections as



peripheral to the main screen experience. They are like an atmospheric sound effect. It is not trying to build something that you can face any direction and get an equally real experience. So it is not quite the holodeck from Star Trek but it is a step in the right direction.

## SEEING INTO THE FUTURE

As controllers continue to evolve, we may well also see an equal leap with the way we experience videogames. A room full of projected imagery and surround audio will provide some additional support to our own imaginations.

We may be a little way from teleported matter and force fields like the real holodeck and we don't have 'Hard Light' to allow us to feel the environment, but we do have haptic feedback devices and real physical objects can be interwoven into the experience. Just imagine a full driving game using a force feedback steering wheel as we have today, but augmented by being able to look out to the sides of the vehicle as the scenery rushes past your sofa on your living room wall. Often science fiction spoils our expectations.

I have no doubt we will achieve a Holodeck experience in time. It may be by projection or even a direct brain interface Matrix style. The important thing is to move forward by building on existing technologies, trying out new ideas and have fun doing it. Personally I can't wait to see how it pans out.

### Further reading

**Oculus Rift** [www.oculusvr.com/](http://www.oculusvr.com/)

**Microsoft Patent** [www.faq.s.org/patents/app/20120223885](http://www.faq.s.org/patents/app/20120223885).

**Ian writes about the future on his website**

[www.feedingedge.co.uk](http://www.feedingedge.co.uk)





# BUILDING ELECTRIC SUPERBIKES

An interview with Mike Edwards by Ian [epredator] Hughes

Back in the late 80's I was doing an Information Technology degree at Leicester Polytechnic and formed a great friendship with Mike Edwards...



# BUILDING ELECTRIC SUPERBIKES

We are both programmers and techies but had the same interests - standing in arcades playing Double Dragon and frequenting bars. We are still both gamers but Mike has taken on an amazing project to radically change the way Superbikes are created for the race track.

He is designing and building a new type of very fast electric bike from the ground up. Every time we meet he has told me something else fascinating about the innovation he is pushing for. It touches every part of the emerging technology world, green tech, 3D Printing and even crowdsourcing. It seemed about time to get him to share it in an interview and tell us a bit more about the amazing challenges and opportunities of their website [helpusinnovate.com](http://helpusinnovate.com).

**Ian: So Mike, tell us a about your background with racing bikes?**

**Mike:** I started off as a road rider and quickly progressed to track days and then racing. I had some potential but often found myself in the wrong place at the wrong time as others tried to ride through, rather than around, me. My Achilles Heel seemed to be that I got hurt quite often so I realised I didn't have a long-term future in the sport.

In 2003 a friend and I created the MiniTwins race series in the UK. The goal was to provide affordable, competitive racing that could be fun for all but also act as a stepping-stone for young riders. It worked so well that ten years later the series is still going strong with packed grids at a number of clubs across the country.

Whilst running the series I spotted a young rider who was starting to get good results but was hampered with inferior equipment. For the following season I built a bike for him and he won the championship during one of the most competitive seasons in memory. The question was then how to help him progress his career so we formed a team and went off to race in the World SuperBike

paddock.

After three seasons competing at some of the highest profile events around Europe we returned for a couple of seasons in British SuperBikes and were destined for some World SuperBike wild card races before supplier issues put paid to that.

It's been quite a journey, I've gone from not being able to adjust the chain on my road bike to being able to strip down and build a full SuperBike engine, program the complex electronics that make up the engine management system or work with the data logging to look at suspension settings or machine geometry.

**Ian: What are the core goals of your Superbike project?**

**Mike:** Having covered pretty much every aspect of building and developing top-level race bikes I became more and more interested in the technical challenges and innovation available in the motorcycling world.

Electric motorcycles have generally started as engineering projects based around fitting an electric drive train in to an existing motorcycle chassis. Unlike an electric car where your key design decisions revolve around four wheels and two, or four, seats with a bike your design constraints are based on two wheels and the engine.

With an electric drive train you have removed the biggest design constraint, yet people seem intent on building petrol bikes without looking at the opportunities of having fewer restrictions in terms of layout, geometry, etc., i.e. not having a heavy engine that can only fit in one position with everything else bolted on around it.

I am a firm believer that pound for pound an electric motorcycle will give greater performance than a petrol one. Obviously we have a long way to go in terms of technology to achieve comparable weight, but after just a few years of development we are already seeing electric race bikes that are running just ten seconds off the pole positions times of the best riders and most advanced petrol machines







in MotoGP. More importantly these electric machines are still approaching things as if they were petrol powered, i.e. replace a big, heavy engine with a big, heavy battery pack and build the rest of the bike around it. If a class leading electric motor can make 200 hp and weigh around 22 kg I should be able to package the batteries in a way that I can maximise the performance from the rest of the chassis.

What started with 40hp air-cooled DC motors just a few short years ago has seen technology leap forward to 200hp liquid-cooled AC motors that are available now.

They may be beyond the reach of hobbyists and those looking to build a top of the range electric bike in their garage but the future is here for those ready to embrace it.

The goal for our project is to demonstrate a new level of performance not seen in any electric bikes to date. An engineering challenge for sure but one that puts as much focus on the chassis opportunities as it does building an innovative electric drive train.

**Ian:** There are some electric bikes, as we saw in the TT what is your take on them?

**Mike:** The TT race proved that there were plenty of people interested in building electric bikes when it first started back in 2009 so the grid mainly consisted of home built bikes in the first year. Over time the grid sizes have fallen but the budgets have grown and now features what can only be seen as multi-million pound purpose built machines.

It was only recently that these engineering projects realised they still

needed a very skilled rider to get the most out of them. The contribution of the rider is much more important on a bike than in a car due to the lean angles and the weight distribution required at high speeds.

Having said that the TT is a 37.7 mile course on the roads of the Isle of Man, with all the bumps, blind bends and even hump backed bridges that you would imagine. Certainly not for the faint hearted at 170+ mph but also not the ultra smooth tarmac of a more traditional circuit.

This demanding fast road circuit requires different performance and handling characteristics compared to racing around circuits such as Silverstone, Le Mans or Monza. With the majority of investment in high performance electric motorcycles destined for the TT I feel there are some significant opportunities for the chassis design when designing class leading electric bikes.

**Ian:** Racing bikes need to be able to race against one another, how are the categories coming along? What happens if you revolutionise designs and get much faster and better?

**Mike:** At the moment there just aren't the numbers of electric motorcycles racing to generate some of the packed grids and highly competitive races we are used to from their petrol counterparts.

This will change but it is important to be able to put on a spectacular show to get the interest of the spectators. In turn, this will help generate more interest and attract more competitors, manufacturers, etc. in to the sport.

We have seen with the MiniTwins series



# BUILDING ELECTRIC SUPERBIKES

that whilst people initially dismissed the relatively low powered 72 hp machines as not very glamorous or exciting most totally changed their opinion once they saw how close the racing is.

The biggest opportunity, in my opinion, is to change people's opinions of what electric bikes can achieve. Ten seconds off the pace of a MotoGP bike is a great start, particularly with just a few years of development, but there are so many other factors that can close that gap.

**Ian: People often talk about batteries and a lack of range, is that fair criticism?**

**Mike:** A battery pack contains a finite amount of energy but you have much greater flexibility in how you use it than a conventional petrol engine. You can choose to use your battery over a longer distance but this will mean you will have to travel at a slower speed in order to complete the race. Conversely, if you were to make the race half the length then you can have twice the performance over that distance.

In essence, a bike destined for the TT has to cope with a little under forty miles of high speed racing but if you only need to race for twenty miles then you have a much greater opportunity to demonstrate the potential performance of electric bikes in general as you can travel faster for longer.

The other key factor with electric motors is that acceleration is a factor of the motor, so to accelerate as fast as possible doesn't really use any more power than accelerating more slowly. The biggest power drain for an electric motor is sustained high rpm, i.e. travelling at high speeds. For example, the power required to race at 180 mph is significantly higher than racing at 160 mph.

A goal of racing flat out for just twenty miles may not seem like much but we are talking about speeds of up to 180 miles per hour. We could easily race for sixty to eighty miles if we limited top speeds to 100

miles an hour.

If we look in to our crystal ball, isn't the future about selling electric motorcycles alongside the current petrol variants? We already know that range anxiety is less of a issue for bikes when an Aprilia RSV4 can barely manage 70 miles to a tank full on track and still costs £17k to buy.

**Ian: Does the design of any racing frame change due to the dynamics and engineering of electric motors and batteries or is it just replacing the motor and fuel tank?**

**Mike:** A petrol motorcycle is hampered by the need to convert four power pulses, one per cylinder, in to grip from the rear tyre in order to drive the machine forward. The trend has been to extend the swing arm to provide greater control from the rear, even if it requires changes to make the engine shorter.

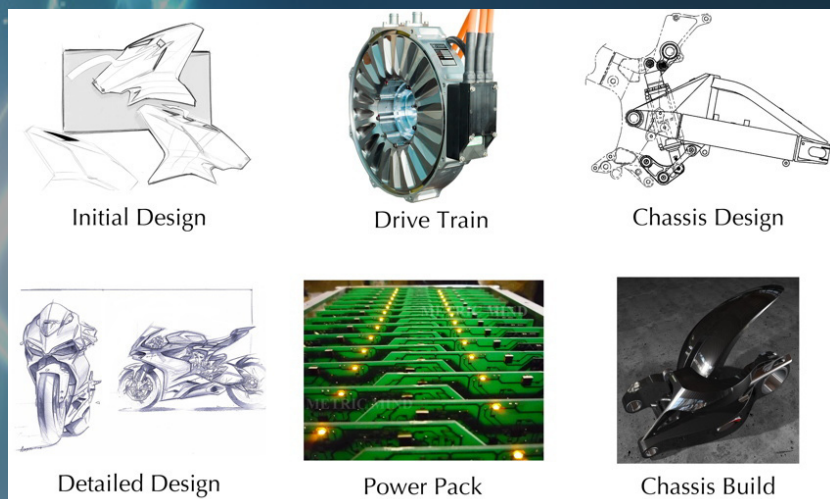
An electric motor on the other hand has an extremely linear power delivery that already puts it ahead of its petrol equivalent in helping the tyre to maximise natural grip. Now imagine the scenario with a longer swing arm? The only thing preventing a longer swing arm in a petrol bike is that bike heavy engine. With an electric bike there is nothing stopping us having our swing arm as long as we want it to be.

Now imagine taking the best of our current crop of petrol SuperBikes and see what we can learn, or transfer, over to the electric bike project. It is common place to find sophisticated traction control in World SuperBikes or MotoGP. Rather than relying on the traditional, and somewhat dumb, power controllers founding most electric vehicle applications why not simply graft on the ECU from a SuperBike and take advantage of the launch control and traction control capabilities?

If we can build a bike that can find extra grip exiting a turn where the competition cannot then to put in the same lap times the bike might only need to hit 160 mph down the straight rather than 170 or 180 mph. We know that top speed is the battery killer under such circumstances so if we can get away with a lesser top speed then we will have even more range from our battery pack.

The only thing restricting the performance of an electric motorcycle compared to the petrol counterpart is the weight of the batteries. We have already seen the advantages from the power train and chassis for an electric bike,





especially as 200 hp electric motors are readily available today. Design a bike for the future, prove what can be done by the first high performance electric motorcycle and when the battery technology catches up simply reduce the number of cells to maintain the current performance or keep the same number for an even more powerful machine."

**Ian: This may be a leading question but... Is there room in the paddock for any other emerging technologies like 3d printing?**

**Mike:** The bulk of any design work for a new motorcycle, whether electric or otherwise, is carried out on a computer. From optimising the chassis design to give the desired degree of flex, improving the aerodynamics and identifying any potential temperature hot spots on the bike and even designing the moulds for the carbon fibre swing arm are all computer based.

Every single piece will then be machined, moulded or even 3D printed. 3D printing is already used in other motorsport arenas and has progressed to that point that bespoke plastic or lightweight aluminium components can be manufactured with ease.

**Ian: An engineering project of this magnitude takes a lot of things to fall into place, takes a lot of people to work together. Are you finding people are willing to share more these days?**

**Mike:** Resourcing has proved remarkably easy in most areas, helped by having a friend already interested in electric motorcycles who designs MotoGP bikes for a living. Between us we have most things covered, particularly as we already have a relationship with other specialist companies

such as Motec having worked with them for some years on our petrol SuperBikes.

Motec provide sophisticated electronics for top level racing with tried and tested traction control and launch control strategies. They are interested in working with us to convert their systems to meet the needs of a world leading electric motorcycle.

The core components are easy enough, Yasa make some of the most innovative electric motors in the world, Sevcon have worked with Yasa to produce the necessary controllers for their axial flux motors and both companies have been very supportive in supplying technical information, engineering drawings, etc. for our project as we undertake the initial packaging and high level design process.

This biggest challenge will be the electric power train itself. A simplified view would be to say whoever has the latest generation batteries is going to win. There has been a great deal of investment in batteries in recent years but the demands of a prototype electric motorcycle, particularly one that is going to be running at the cutting edge, has to package the most power and therefore must target the highest energy density.

Battery manufacturers have been busy innovating but it's a different market if you want your Nissan Leaf to have a one hundred mile range and still be able to recharge the battery a thousand times, i.e. releasing energy slowly over a longer period of time presents a different challenge to being able to safely use all the energy quickly. Unfortunately most of the innovation and research in recent years has, understandably, focused on the electric car market whilst the rest of us have to make do.

It's not all doom and gloom. It is perfectly feasible to exceed the manufacturer specifications as they won't have tested the cells under the conditions we are likely to be using them in. If they need to still achieve a thousand charge cycles they may only rate them as being able to discharge over a specified period of time. As long as we undertake stringent testing to ensure we can discharge the cells at the rate we need we can live with a trade off of perhaps only getting a couple of hundred charge cycles, at least for our prototype.

To keep it safe the Battery Management System (BMS) must be quite advanced, especially if we opt to utilise some of the more volatile but higher density cells in our



# BUILDING ELECTRIC SUPERBIKES

basic knowledge of battery technology from one company before they politely bowed out when it became clear we needed to use some of the more volatile, higher density cell chemistry that they had no experience in.

Looks like we are going to have to do the bulk of the work ourselves although we do have enough friends in the right places to make sure our design not only works but follows our usual approach of over engineering the solution with numerous back ups and fail safes so we can be more than confident that we can successfully manage any potential situation before things get out of hand.

**Ian: How are you approaching funding? I people want to get involved can they?**

**Mike:** Our initial plan was to secure enough sponsorship to allow us to build the bike and then race it in the TTXGP race series for electric motorcycles using the sponsor's livery and branding. We thought that should be a compelling enough story, especially if backed up with a documentary following the progress of the project.

Whether it was just the timing of the project as the Olympics max-ed

out most marketing budgets or whether we just weren't selling the right package to the right people we had no takers initially. One consumer electronics company complained that our plans didn't seem to be technical enough, something I've yet to get to fully understand, or a well known brand with a massive spend on green energy that was happy that their sponsorship of one of the British teams in an Olympic event would hit all their marketing goals for the year.

One thing we have realised is that there is a massive interest in green technology and electric vehicles coupled with a scarcity of information about how to build them yet alone any behind the scenes type footage of people actually doing

it. It is far more mainstream than our usual audience when we race our petrol engined SuperBikes which I believe makes it an even more compelling story.

With a new year we are trying a new approach. Rather than try to finance everything in one go we are breaking the project up in to a number of work streams. As we achieve the fund necessary to complete each step we will embark on that piece of development.

## **The steps currently include:**

**Initial Design** – Define basic packaging, chassis layout, etc.

**Detailed Design** – Comprehensive design showing every component, fastener, etc.

**Power Pack** – Build battery pack with integrated cooling, Battery Management System, etc.

**Drive Train** – Build integrated motor and controller, wiring harness, etc. & fit to motorcycle

**Chassis Design** – Carry out structural analysis, air flow analysis, etc.

**Chassis Build** – Build carbon fibre frame & swing arm. Fit to forks, yokes, wheels, etc.

In addition we intend to look for a sponsor to cover the cost of filming the documentary in return for the rights to the final film that I hope would be made available to their clients, customers or even just uploaded to YouTube with their branding.

Assuming a sponsor is interested in helping us record the development for posterity how do we plan to fund the rest of the work? Having worked second jobs and even sold my house to pay for some of our petrol racing exploits we are looking at a range of ways to both raise the funds and increase the profile of our project.

In the spirit of Kickstarter.com and the plethora of similar sites we have decided to follow the crowdsourcing model, i.e. encourage people with an interest in electric motorcycles to support the development of ours.

Crowd sourced projects usually involve contributing financially to a project and receiving a sample of that product in return. The one thing we can contribute in return, i.e. our 'product', is that we can provide detailed access to the design and physical build of each part of the project for those that are interested.

Given the number of people that are interested in green technology, electric vehicles and even motorcycles in general we are sure we can build a community







around our electric motorcycles project.”

**Ian:** What would your dream situation be?

**Mike:** This is an engineering exercise to prove our belief that pound for pound an electric motorcycle can have greater performance than a petrol engine equivalent.

There are still challenges ahead, particularly given the current state of battery technology, but as that develops the bike can either dramatically lose weight or significantly increase power. With half the weight of the bike being the battery pack the opportunities for the future look promising.

In an ideal world the funding challenge would be easily overcome, whether through sponsors who fully appreciated the opportunity or through the crowd sourcing route.

The opportunity to race not just with other electric bikes but also against modern petrol bikes should provide a full testing program and a good demonstration of the capabilities of the project.”

**Ian:** Finally, is getting a project like this, and running a team, as much of a buzz as riding in a race?

**Mike:** Competing in a race is pretty intense although nowhere near as hard as running a team. Over the years more time has been spent building and developing bikes. The appreciation of what is required from the chassis, the engine and the fine tuning required with the suspension suggests that there are so many opportunities to be had through building an electric motorcycle than nobody has really explored yet.

This project will change how people think about electric motorcycles. That is way more exciting than racing!

**Be part of it at**  
**[www.helpusinnovate.com](http://www.helpusinnovate.com)**

**Ian:** Thank you Mike for that incredible insight into some very exciting innovations. Fancy a game of Double Dragon?

**Mike:** “Thank you too.

IAN IS PART OF THE ‘COOL STUFF COLLECTIVE’  
ON ITV AND ON TWITTER @EPREDATOR  
THE FUTURE CAN BE FOUND ON HIS WEBSITE  
**[WWW.FEEDINGEDGE.CO.UK](http://WWW.FEEDINGEDGE.CO.UK)**



# GROUND CONTROL TO MAJOR <YOUR NAME HERE>

## Space Tourism

By Ian Hughes/epredator  
Feeding Edge Ltd

Visiting new places can be fun, but sometimes the journey can spoil the adventure. Long days with no mobile or internet signal on a crowded train, or gridlocked on the motorway can take the gloss off even the most glamorous locations.

What we need is something even more exciting. Something where the journey itself is the holiday experience. Something like a modern version of the Orient Express, but with more science and technology thrown in. Enter - Space tourism

Whilst leaving the atmosphere of the planet may not be to everybody's taste, it's hard to deny the influence Space has had on us techies. Star Trek, Star Wars, Red

Dwarf, Dr Who, Blake's 7 etc. all feature prominent space-based story lines. Whilst manned missions to the moon have not happened for a while, some of my earliest memories are astronauts bouncing around the surface of the Moon. Giant Apollo rocket systems with computers no more powerful than a digital watch getting people 384,400km there and back again. When I grew up I wanted to be an Astronaut/Starship Captain/Jedi!



Today if you grab something like the **Arduino Starter Kit**, the very first project for people to build is called Spaceship Interface. It's basically a couple of flashing LED's, and that there is a bit more of the spaceship that needs to be built to make it workable. However it shows that space travel, or wanting to be in space is still part of our culture and hopefully our future.

So what are the options to be a Space Tourist?



any airline. The "seat" does cost \$5,197.50 though. You get about 15 repeats of the climb and float, that's 375 seconds of freedom Earth's gravity.

\*\*\*\* zero G pics \*\*\* check style sheet for their pic use guidelines \*\*\*

For the next option though \$5000 is a rounding error. In June 2000 Dennis Tito became the first proper space tourist. i.e. he paid for his ticket rather than joining an organisation and going into space as his workplace. Through a company called MirCorp he visited the then ageing Russian space station Mir. It is said to have been a \$20 million ticket to ride. However shortly after the whole operation fell foul of international politics, and the Mir space station was 'de-orbited' a year later.

## VOMIT COMET

The delightfully named **Vomit Comet** is the simplest way to feel something of Space. Using a large commercial jet plane you are flown to 30,000+ft at 45 degrees and then levelled out at the top of a parabolic trajectory.

For about 25 seconds you achieve weightlessness. This technique has been used to train astronauts since 1959, but is now more commonly seen on TV science shows as presenters try and deliver a piece to camera whilst weightless.

NASA has a company called **GoZeroG** that you can just click and make a reservation like



# Space Tourism

## THE SPACE RACE

Private firms were encouraged to look into space travel through the efforts of the Ansari X PRIZE. The X PRIZE model started with offering a \$10 million payout to the first people to build a private space vehicle that could take three people twice in two weeks into Space.

Ten times the prize money was invested by various companies in new technology in the race to the goal, creating a massive leap in human understanding of Space travel. It was achieved by a design called SpaceShipOne on October 4th 2004. This could be regarded as the date space tourism got the green light. The X PRIZE competition has spawned many other competitions. Including a Google prize to get a privately funded robot on the moon worth \$30 million and Qualcomm's \$10 million to create a Star Trek style handheld medical scanner (like a tricorder)

<http://www.xprize.org>



## TUBULAR BALLS

New startups vying for your attention and to get you traveling into space are popping up all the time.

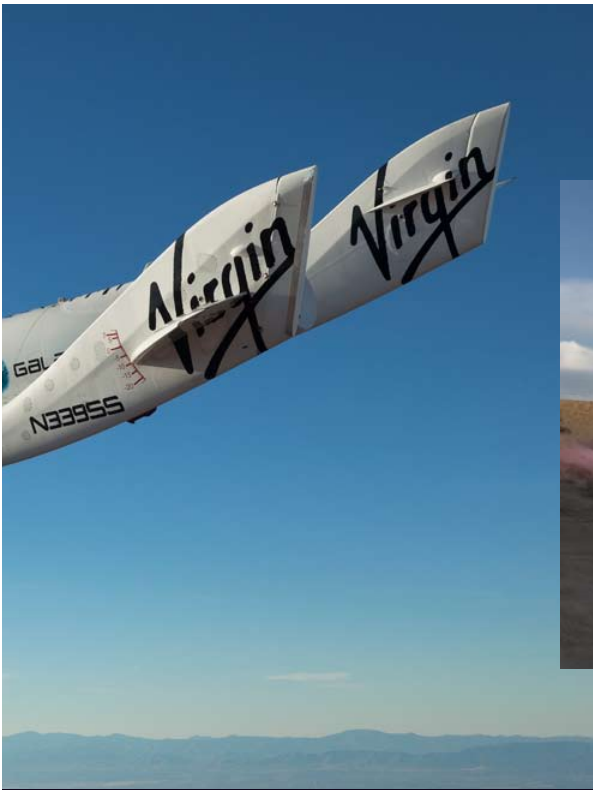
Arguably, the most well known is Richard Branson's **Virgin Galactic**. The main space ship component is called SpaceShipTwo which you may spot is the next iteration of the original X PRIZE winner. Carried up close to Space by



another plane WhiteKnightTwo, the Mothership carries the six passenger craft up to 50,000ft where SpaceShipTwo then kicks in a hybrid rocket motor and sends you at Mach 4 (4 times the speed of sound) up through the imaginary Karman line 100km (62 miles) up where Space starts.

Once there they cut the engines and you are weightless and an official space tourist. All that is just \$200,000 or \$1million to book the whole flight out for you and five friends. I don't know about you, but if I had that sort of cash I would most certainly pay for this experience!





Virgin Galactic has not announced an official date to fly yet, but it is highly likely it will be towards the end on 2013. XCOR and their Sub orbital Lynx ship trip is also coming soon at a mere \$95,000.

**Space Adventures**, on the other hand is already flying sub orbital flights for \$110,000 and has plans for orbital flights and even a lunar mission in the future. That is where it gets even more interesting. All these sub-orbital flights are about going just about into space before dropping back down. It's good, but it doesn't get me sitting on the Captain's chair of the USS Enterprise or opening up the X-Wing on a fighter.

## MAN ON THE MOON

It is over 40 years since Gene Cernan became the last man to step on the moon. Governments raced to get there, then once they got there it stopped.

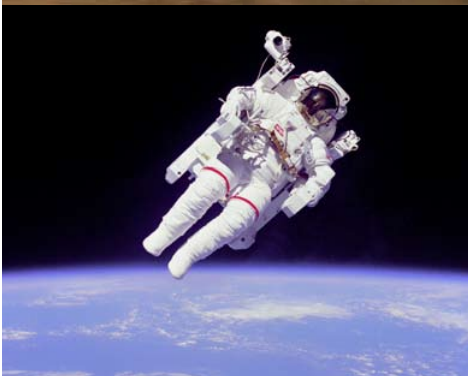
The vacuum of Space is a dangerous place to be. It costs LOTS of money to get things (and people) out there and more importantly get them back again.

Sending the Curiosity Rover to Mars has been a fantastic achievement. The science and technology involved is still awe-inspiring. Curiosity is driving around Mars performing all sorts of experiments, communicating back to Earth and using just 140 Watts of power. It has a two year mission. There are more Mars missions planned too.





# Space Tourism



Dennis Tito, yes him again, the worlds first official space tourist is part of a project that aims to send a man and a woman on a mission to orbit Mars.

The aim is January 2018. It will be a 501 day round trip. The not-for-profit company, **Inspiration**

**Mars** is the vehicle for this endeavour.

2018 is important as this makes the return journey a quick "free-return" orbit (a slingshot effect that needs no engine power to make the return) due to the relative position of Earth and Mars. The next window of opportunity would be 2031. So the race is on to meet the deadline.





## Next stop Mars

If orbiting Mars is not your thing, but you do want to get down on the surface, then Mars One is the company for you.

The mission objective for Mars One is to have a human settlement on the surface of Mars by 2023. Another not-for-profit organisation with a global view of traveling out into space. On the timeline the habitat and equipment heads to Mars before 2020 where it is assembled by rovers and automated units, then the crew heads there in 2022, with more following later.

The astronaut selection process is already underway and anyone can apply. It's a lot cheaper than any other of the options, but is more of a vocation than vacation. For all you bloggers and tweeters, Mars One will also be a project with extensive social media opportunities.

Live streams from the surface, and lots of communication about what is being done out there, and what is being built will be freely available.

For all those would-be space tourists interested in applying, there is one

important piece of information to consider. This is a one way mission.

Once relocated to Mars, you would be there for good, and you would become a Martian. A true colonist of another planet.

There might not be any atmosphere, but wouldn't that make a great check-in location?

Ian is part of the 'Cool Stuff Collective' on ITV and on Twitter @epredator. The future can be found on his website [www.feedingedge.co.uk](http://www.feedingedge.co.uk)

### Links

<http://www.gozerog.com>  
<http://www.virgingalactic.com>  
<http://www.xcor.com>  
<http://www.spaceadventures.com>  
<http://www.genecernan.com>  
<http://www.inspirationmars.com>  
<http://mars-one.com/>





# Hmmm Delicious

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*Where are we  
going with our food?*

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BY IAN HUGHES/EPREDATOR FEEDING EDGE LTD

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Every now and then we get a food scare in the UK, the latest was regarding the quality of some minced beef products. Apparently they were more Dobbin the Horse than Daisy the Cow. Whilst this situation appears to be caused by producer greed and cost-cutting exercises it may mask a bigger problem; namely the world population is set to outgrow our traditional food production abilities.

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# Hmmm Delicious

*Where are we  
going with our food?*



A report, *Livestock's Long Shadow*, by the Food And Agriculture Organisation, part of the United Nations, in 2006 stated:

“Livestock now account for about 20 percent of the total terrestrial animal biomass, and the 30 percent of the earth’s land surface that they now pre-empt was once habitat for wildlife.”

“The livestock sector is a major player, responsible for 18 percent of greenhouse gas emissions measured in CO<sub>2</sub> equivalent. This is a higher share than transport.” So our global traditional farming of animals, and the crops and water to keep them is having a major impact on the planet as our population grows. We are running out of room to feed ourselves.







## *Pull the Switch Igor*

Science is looking for answers with the genetic modification of crops. IE Adjusting the structure of living organisms through manipulation at a chemical level, rather than the 'traditional' approach of breeding new strains over time. This is much more than adding food colouring into a vase and watching a flower change colour as it draws up the coloured water. 'GM' as a branch of science stirs up many emotions on both sides of the argument. Franken-foods is one take, modern marvel the other. We have the science to leap forward ahead of pests and climate change, but we don't yet know the

long term effects these may have to the entire eco system and food chain.

From its traditional use in crops to make them a higher yield or more resilient, GM food has now climbed the evolutionary ladder a few rungs to Salmon. "AquAdvantage® Salmon" grow faster than their wild cousins and are being raised in fish farms with all female sterile colonies. We each have to consider our comfort level for things like this. Salmon engineered to grow bigger and faster than normal. Twice as much fish available? But unable to breed? Just like the dinosaurs in Jurassic Park?

Even if we use GM to improve crops and enhance the animals in our food chain they are still taking up the same amount of land and probably emitting the same amount green house gasses. So what is the alternative?

## *Waiter, there is a fly in my primordial soup!*

One avenue that may help solve many of the world's food and fuel problems could well be Algae. There are many different types, ranging from a single cell organism that can be cultivated and harvested as a colony to Macro Algae, i.e. seaweed.

According to the industry, Algae can be harvested and refined into bio fuel. The protein and carbohydrates can also be used for human and animal food and other chemical and pharmaceutical products too. Algae is a more resilient crop and can be grown in places that traditional plants fail to



# Hmmm Delicious

*Where are we  
going with our food?*



thrive. They actually reduce CO<sup>2</sup> in the same way trees do. They are part of the balance of nature.

Green sludge may not sound overly appetising, but there is another food source that may help us all - Insects.

They might not be to everyone's taste either but insects could well be the Sunday Roast of the future. Another UN report from this year "Edible Insects - Future Prospects for food and feed security" points out that 2 billion people in the world already supplement their diet with insects.

With over 1,900 different types commonly eaten, there is certainly a large menu to try. Insects offer high fat, protein and fibre content, though that varies depending on the type of insect. They can also be raised on "organic side streams". i.e. Animal and human waste. (To quote Candy Crush "Tasty!!"). Insects are far more stackable than cows or sheep. Obviously they are smaller in size but the environments or vats to cultivate them offer high rise farming opportunities.

In case you are thinking that insects are just a filler in the food chain, one of the world's best restaurants Noma created a pop-up food experience at Claridges, London in 2012. On the menu was a dish called "Ants". Over 27,000 ants were caught in the wild and shipped over from Denmark. They formed part of a cabbage leaf dish dressed with creme fraiche. The diners chewed the ants, still alive. Apparently this released a slightly stinging taste as the ant



defended themselves. So insects are Michelin starred after all and I'm sure it won't be long before we see a celebrity chef cooking some caterpillars.

## *A Pizza in 30 mins or your money back*

I have written and talked a lot about 3d printers before (see Flush #3), but just a few weeks ago NASA announced a \$125,000 grant to an Austin, Texas company SMRC to create a prototype food synthesiser.

Using the concepts of rapid fabrication to layer nutritious, tasty and visually appealing pizzas from raw parts. It is a relatively small grant but does indicate a direction for food







production. NASA is obviously interested in the long term needs of astronauts in space. At the moment most space food is really just army ration packs. You can buy “space food” which is freeze dried at -40c and comes in a little pouch, you can even get an ice cream sandwich (see pic). In a recent interview with Danny Baker, Piers Sellers a British-born astronaut talked in part about how disappointing the food in space can be and the trading that goes on between Russian and US groups to get a different set of rations up in space.

At the moment printers are going to be just assembling layers of existing materials but we can assume that over time we'll get to ones that manipulate matter at a lower molecular level. This of course will be like real-time genetic modification. So we

will once again have some worrying/exciting scientific and moral dilemmas to deal with.

It may just be that taking the raw materials from simpler supplies like algae and insects we can still produce interesting and stimulating recipes but on a 3d printer. Whatever the future holds it will change what recipe books are forever and should certainly need a new rating criteria from Michelin.

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Ian Hughes is part of the ‘Cool stuff Collective’ on ITV and on Twitter @epredator.

The future can be found on his website [www.feedingedge.Co.uk](http://www.feedingedge.Co.uk)

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Further reading

[www.aquabounty.com](http://www.aquabounty.com) - Salmon

[www.allaboutalgae.com/faq/](http://www.allaboutalgae.com/faq/) - Algae

[https://audioboo.fm/boos/1112274-](https://audioboo.fm/boos/1112274-danny-baker-s-spaceman-interview)

danny-baker-s-spaceman-interview Piers Sellers Space food interview

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# MODERN TECHNOLOGY FABLES

BY IAN 'EPREDATOR' HUGHES





## CARP(E) DIEM

A fable is a story or example that often seems like unrelated to the end outcome. It is, in systems and technology terms, a 'pattern'. Humans understand patterns really well. However sometimes other details get in the way. IE "You can't see the wood for the trees".

I wanted to explore how we end up with the various pieces of technology in our lives at home and at work. How sometimes we add the wrong things, or why we remove one thing just to replace it with the another set of problems.

From Koi carp to the Xbox One in a Parkour style free run of ideas. So here goes.

## IT WORKS, NATURALLY

We recently moved house and with the new place we inherited the previous owners Koi carp pond. Some large and old fish inhabit this pond. People usually see, or hear about them, and say "Oh they are worth a bit of money". That may well be the case but I was more concerned about how to maintain their eco system.

I looked at this 12,000L of water with a pump, an ultraviolet pre filter and a bath size filtration system and it intimidated me. It was a blend of modern technology, plumbing and a natural system. I have an aquarium already, it has fish and a filtration system, I know how that works. Somehow my initial reaction to the scale of the pond and the age of the Koi blinded me from the obvious. It is the same sort of system just bigger. Like a repeating pattern in a fractal rendition. The same pattern just a different scale.

It struck me that this is how many people look at any new technology that comes their way. Often they will see it is

too big and scary, too different to get to grips with. Why change when something we already have is perfectly good. "It is the way we have always done it". In the case of the pond of course there was not a option. It was there, it needed dealing with. Science and technology head on.

Ponds and fish tanks have a natural cycle they have to go through. Regardless of the technology involved it is just the plain beauty of nature. The Nitrogen cycle has to happen. It is a pattern that will occur. A sequence of events that can be helped or hindered by our intervention with various types of technology.

- Decay. Things rot away, waste from the fish, uneaten food. This produces Ammonia.
- Ammonia is consumed by a bacterium called Nitrosomonas. This creates Nitrite.
- Nitrite is then consumed by bacteria called Nitrobacter, release Nitrate.
- Nitrate feeds the plants.

The two steps in the middle, the Ammonia and Nitrate are not good for the fish. Filtration systems help harbour the good bacteria that make the conversions. A regular aquarium tends to have a small collection of tiny ceramic tubes as part of the filter that have a relatively large surface area for the bacteria to live and feed on. The Koi pond has a giant bucket of plastic tubes that has the same effect. This was my first fractal pattern match. They may be bigger, and more of them, but it is the same as something I already know.

There are all sorts of chemicals and additives that you can buy for an aquarium to help the lifecycle or deal



# MODERN TECHNOLOGY FABLES

with particular spikes in parts 2 or 3. Generally though just leaving it to it, with some minor maintenance will keep it all in check. You reduce decay by having less fish, less food and healthy plants, which of course get more healthy with a good Nitrogen cycle.

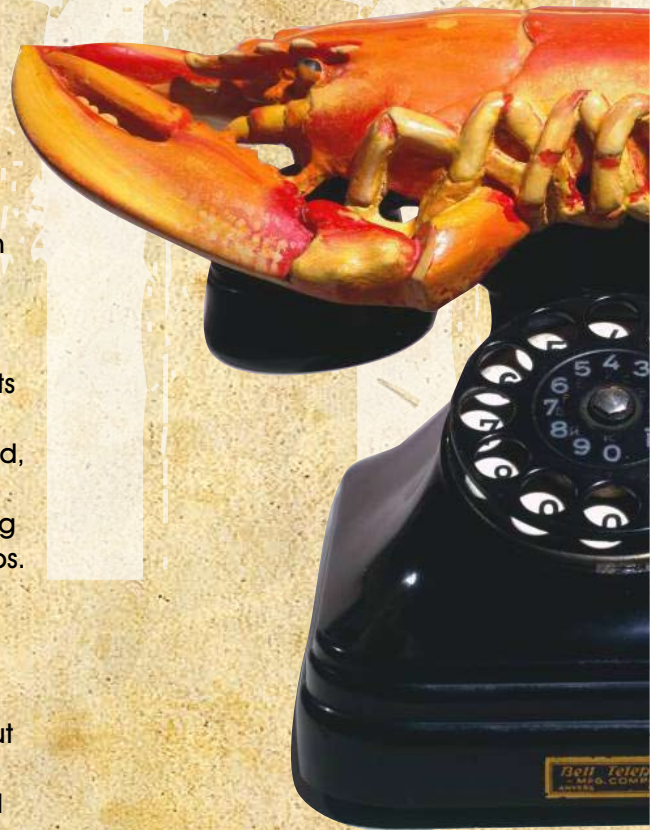
## BALE OUT

Unfortunately the pond has good plants and bad plants. They all feed off the same Nitrate. In this case lily pads good, blanket weed bad. The blanket weed has a nasty habit of growing, spreading and then blocking the filters and pumps. This of course eventually will stop the cycle, without regular intervention and maintenance.

So we have a virtuous cycle well established and something trying to put an organic spanner in the works.

My first reaction was to get the pond stripped down cleaned and refilled to remove the weed. That of course is a very silly idea. It destroys everything that is working so hard across the system. It is starting from scratch and the entire cycle, with all its spikes and troughs has to begin again. A new version of the same system, with the same inherent problems.

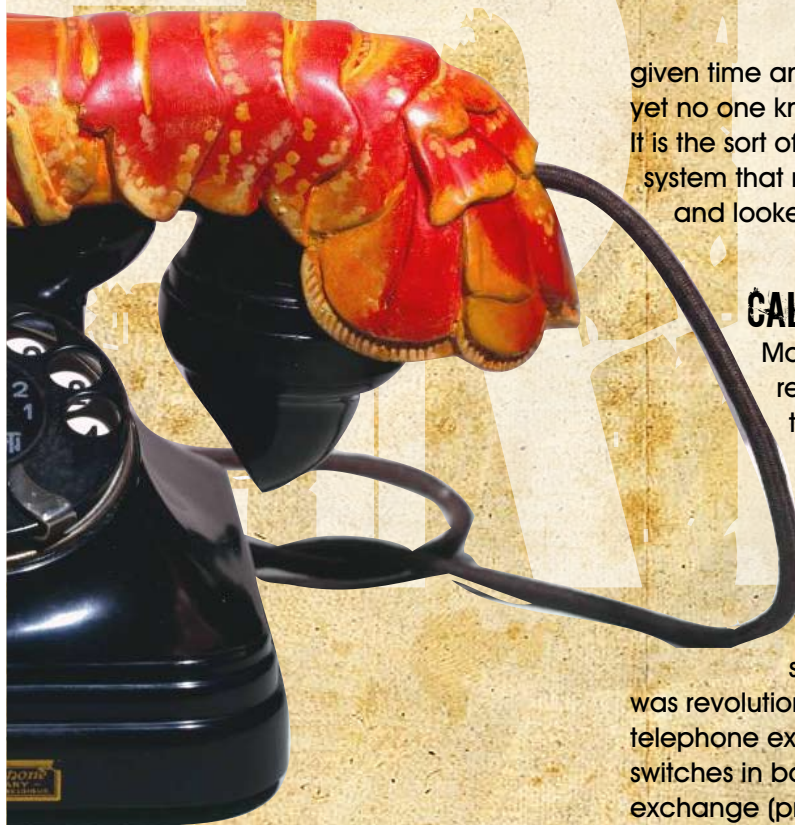
Next I looked for a modern solution. The various potions and chemicals that might help deal with the weed. These all looked interesting but very expensive for an experiment that may end up harming the system I am trying to keep in check. It turns out though that a much older technology is the most useful. Aside from manual effort to keep the weed at bay it seems a way to slow the weed and any algae growth is to use small bales of barley straw soaking (and rotting) away in the pond. To a



technologist like myself this solution seems old fashioned, surely a rotting hay bale is not the solution? However, whilst the scientific proof may not be conclusive, there is a lot of anecdotal evidence that this extra decay in the Nitrogen cycle seems to halt the bad stuff. Elements of the rotting barley hay absorb sunlight and a mini system of reactions end up creating Hydrogen Peroxide in small amounts that kill the algae and weed.

I have yet to see if this will work for our pond. It is a change that takes time, and also still requires lots of manual work. However it would seem that a small tweak, a minor addition to the system is a lot more effective than a knock it down and start again approach.





given time and justify the contents of, yet no one knows why they exist at all. It is the sort of artefact generated in a system that no one has stepped back and looked at.

## CALL ME MAYBE?

Many people know will not remember using an old telephone dial, though still the image of a round dial with a finger hole for each number still resonates with many. The telephone number, a unique address for an electrical signal to be routed too

was revolutionised by the mechanical telephone exchange. The Strowger switches in banks at the telephone exchange (pre digital technology) acted like a gear that turned to connect numbers. Number 1 was at the top of the gearing, so it connected with little rotation. Number 9 was at the end of the gearing so it took a much longer time to mechanically engage, click, click, click. The dial on the phone at the human end was deliberately slow in returning to the next number dial position with a mechanical delay in order to allow the Strowger switch to engage. The system changed the way we were able to operate. We had to be slowed down to allow it to catch up. Imagine if we had persisted with the dial and its mechanical delay well into the digital age? Just because "it was the way we had always done it"?

## STEP BACK AND FRACTAL ZOOM

If you step back and look at a thing that you do at work or at home you can take a systems view of it all. Do not worry about the detail of a particular task and ask yourself, your colleagues or your family, why are we doing this? Is there an absolutely rigid cycle that has to happen (like the Nitrogen Cycle, night and day, gravity etc). If so can we add or take away something that will make it just a bit easier for everyone?

Or have we started to do something that is on the whole just for the sake of it? It is masquerading as a thing that needs to be done, "the way we have always done it"? If you haven't seen film Office Space I suggest you have a look at that. The infamous "TPS reports" that everyone is asked to do, complete in a

## WHERE ARE MY KEYS?

Strangely though we have managed to keep a mechanical restriction in



# MODERN TECHNOLOGY FABLES

other devices despite it seemingly not needing to be there. We do that with our computer keyboards, and even those keyboards on touchpad screens with no moving parts at all. The QWERTY keyboard layout has become a “way we have always done it”, for typing words. The layout is a very clever one as it is derived from the need to spread out the letters commonly used in a language (in this case English) so that the striking hammers of the original typewriters had time to make contact and return and not jam by colliding with another letter. If you have used an old typewriter you will know the frustration of hammer jams. If you have not, you will have experienced the same frustration

on a computer keyboard where some of the keys are not working quite properly, probably due to coffee being spilt at point. You have to press just a bit harder to get it to work.

We have adjusted to the mechanical problem as users. It turns out the layout works well in reverse. we used to be stopping mechanical jams of the technology. Now the technology is faster than we are the QWERTY keyboard is actually stopping our fingers from jamming into one another it would seem.

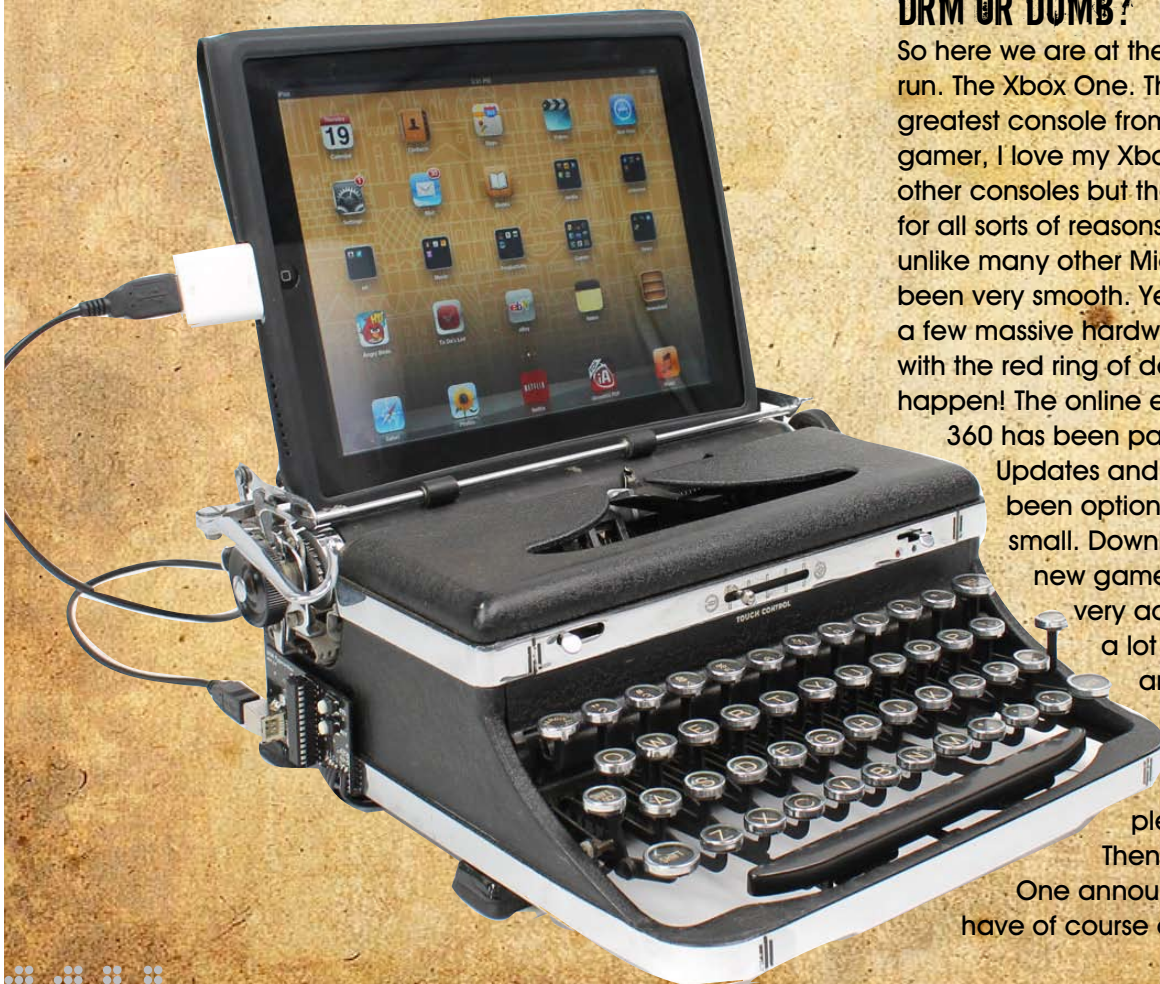
Where does that take us? Technology enforcing restrictions and systems that just need a tweak?

## DRM OR DUMB?

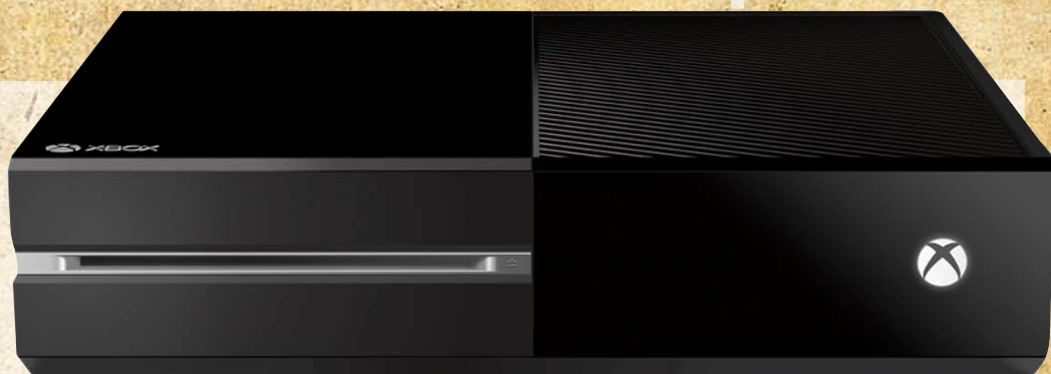
So here we are at the end of the free run. The Xbox One. The latest and greatest console from Microsoft. I am a gamer, I love my Xbox 360, I have the other consoles but the 360 gets my vote for all sorts of reasons. The experience, unlike many other Microsoft ones, has been very smooth. Yes, ok there were a few massive hardware collapses with the red ring of death but that can happen! The online experience with the 360 has been particularly good.

Updates and patches have been optional, and generally small. Downloadable content, new games, demos etc all very accessible. I buy a lot of games and I am happy to lend friends games for a while too. It has all been very pleasant.

Then came the Xbox One announcements. These have of course changed since,







but I was completely amazed at how drastic Microsoft got with the whole online digital rights management (DRM) debacle. They showed us the new box, the fancy Kinect 2.0 and some great game demos. They then confirmed that your new Xbox One had to connect to their servers once every 24 hours in order for your games to work, the games that you had bought and paid a considerable sum for? That may have been wrapped up and sweetened with lots of other cloud and server based game features but somehow it just seemed completely over the top. This was a Strowger switch pattern, stopping us doing what we do for the benefit of the technology (in this case DRM). Obviously you have to connect to the net to play a game online, but it was mad to require that for everything all the time, just to be spied on. They had taken a perfectly good system, one that many of us enjoyed (and paid for) and thrown it out in favour of something that they considered was better (for them and the publishers). In a mass gamer outcry about used games, sharing games, and just a generally snooping and controlling factor, Microsoft made a massive turn around. Well it was a less of a turn around than ending back where they should have started from. It seems though they have not found their Barley hay bale solution yet. They were about to clean out the pond and kill some of the fish, but now they are leaving well alone. That does seem to remove the feature of a central list of the things you

own so you can play them anywhere?

I am not sure why they can't do that as a slight amendment to the system, and opt in. I don't want to have to check with them every day if I can still play a game, but if I am playing a game online, surely they know that it is me? If I go to a friends house and download my profile (as we can today) I have, by the very nature of the connection, attached willingly to the network?

Apple manage this with iTunes match. A service that knows what you have bought and lets you stream or download to devices that you log into once. It is really quite simple. Yet once I download to a device, like an old iPod I don't have to check back with big brother each time I play a track.

I still can't work out if Microsoft really meant this, or if it was a PR stunt. Say something draconian, if it goes down well fine go ahead anyway (sniggering and ringing hands with glee), if not then reverse it and say "hey we are listening". Or if it was just plain stupid, not looking at the entire system and focussing on a detail that was of no importance, just because they could.

I am looking forward to the new wave of consoles. I like consoles and I like games and after all "it's the way we have always done it"..... Doh!

**Ian writes about the future on his website [www.feedingedge.co.uk](http://www.feedingedge.co.uk), you can also follow him on Twitter @epredator**



# SKATING

SAFETY MEETS THRILLS

BY IAN HUGHES/EPREDATOR /FEEDING EDGE LTD



The Pathfinder reduced any landing damage as they hurtled to the Martian surface with Vectran fabric airbags.

## ICE ICE BABY

Technology is usually connected to how we entertain ourselves. It is only through the application of technology that we would have an Ice Rink in our local town working and busy at the height of one of the hottest summers the UK has seen. We visited early one morning at the start of the school holidays, it was misty, quiet and very spooky inside. Next time on a regular Saturday afternoon it was more lively and vibrant. Somehow, whilst not even moving my wife's skates went from under her and she was down on the ice

with a bump and our next stop was the A&E department of our local hospital. After a few hours in queues and waiting rooms, x-rays and some injections they pushed the broken wrist back into place and set it in a good old-fashioned plaster of paris style cast.

We then had to return the next day where the specialist decided that it needed to be reset under a general anesthetic so she had to spend a night in hospital and ended up with a brand new old-fashioned plaster of paris cast. All very unpleasant, but it could have been a lot worse. The 6+ weeks of being in the





# on thin ICE

cast proved very inconvenient too. So what could have stopped such a simple accident from happening? Apart from not going ice skating of course! Wrist guards are an obvious thing to use, and I would recommend them for all skating/boarding sports.

## ALL A LOAD OF HOT AIR

However it may well be that airbags are the answer. Or at least they may be in the future. We are used to the concept of an airbag in a car protecting the occupants by rapidly and explosively inflating when an accelerometer detects dangerous changes.

What happens if you put the airbag on the person though? The first I noticed were on the MotoGP bike riders. The investigation and use of them started around 2001 and the technology and sensing has been improved over the years. Marc Marquez recently survived a 210 Mph crash. This was in no small part because of his Alpinestars Tech Air Race suit which inflated in 50 milliseconds before he hit anything solid at Mugello. This spread the impact and reduced his injuries so that he was able to continue racing that weekend.

This approach of multiple sensors detecting a situation and acting is already rippling down to products in the marketplace aimed at somewhat less speedy pastimes, but none the less dangerous ones.

Whilst this is starting to get a bit like the foam filled car crash protection in Stallone's film Demolition Man (and what were those three shells for anyway?) we are getting to the point of being able

**Alpinestars Tech Air Race suit inflates in 50 milliseconds before a rider hits anything solid.**



to completely protect a large area with an air bag. The Mars Rover (and before that the Pathfinder) reduced any landing damage as they hurtled to the Martian surface with Vectran fabric airbags. Vectran is twice as strong as Kevlar and works better in the cold temperatures of space.

## FASHION VICTIM

Closer to home Hovding have created a designer airbag crash helmet for cyclists. The interesting part of this helmet is that when it is not being an airbag crash



# SKATING

SAFETY MEETS THRILLS

helmet it's a stylish item of neckwear. It only becomes a crash helmet when it detects the cyclist is falling and due to to hit something. At which point it explodes into a large science fiction looking air spaceman's helmet. It creates a protection point for the entire head and chin unlike most bike helmets that protect just the temples and top of the head.

## SNOWED UNDER

Getting back to more wintry conditions airbags are starting to be used as avalanche protection too. These tend to be ones that the wearers pull on to inflate when they are in a risky position, or even already caught in an avalanche. The airbag in this case protects the persons head and neck from the weight of the snow and gives some space to breathe, but they also help float the person to the surface of the snowfall for rescue or escape.


## SKATING ON THIN ICE CREAM

We don't yet seem to have inflating gloves that would have protected my wife's wrist but I did wonder if we could have an ice rink that was solid to skate on but soft when you fell over. It needs the opposite of the properties of corn starch or Oobleck. They are soft until you apply force then they display their non Newtonian properties and become rock hard.





# on thin ICE



It appears there are such substances in principle that are harder at rest than soft when force is applied. Shear thinning or pseudoplastics alter their thickness in these conditions. Strangely canned whipped cream is one of these. We used a lot of whipped cream on The Cool Stuff Collective as I often had to "custard pie" willing participants in a slapstick style. As the cream is forced through a nozzle it sheers and it becomes more liquid like, it then reforms on the plate and holds structurally.

Of course it deforms again very quickly when applied to a face, and tends to splatter everywhere.

So could the good old fashioned custard pie be the answer for a new type of ice rink? One that takes the apparently comedic falls and deforms gently around the person's body? That may be a step too far for science and for fun of course. One of the reasons we do these things is because they have an element of risk. Would being too safe spoil the fun?

For now I think we should stick to wrist guards don't you?

## ADDITIONAL READING

[www.alpinestars.com](http://www.alpinestars.com)

[www.hovding.com](http://www.hovding.com)

[www.livescience.com/21536-oobleck-recipe.html](http://www.livescience.com/21536-oobleck-recipe.html)

Ian writes about the future on his website:  
[www.feedingedge.co.uk](http://www.feedingedge.co.uk), you can also follow  
him on Twitter @epredator

# REEL TO REAL

Want to  
make a  
Christmas  
Number  
one?

Ian Hughes/Epredator/  
Feeding Edge Ltd



## Make some noise

When I was 8 years old we had a (now rare) piece of technology at home called a reel-to-reel tape player. For those of you who have never seen such an archaic piece of equipment it contained two large open spools and a small magnetic tape wound around the spools. A motor unwinds one spool to the other whilst passing it over a magnetic head. That picks up the minor magnetic differences on the tape, passes it to an amplifier and sounds come out. Simple. I was fascinated by it, and in particular by its mechanical interface.

Gears and motors were controlled by push and pulling levers

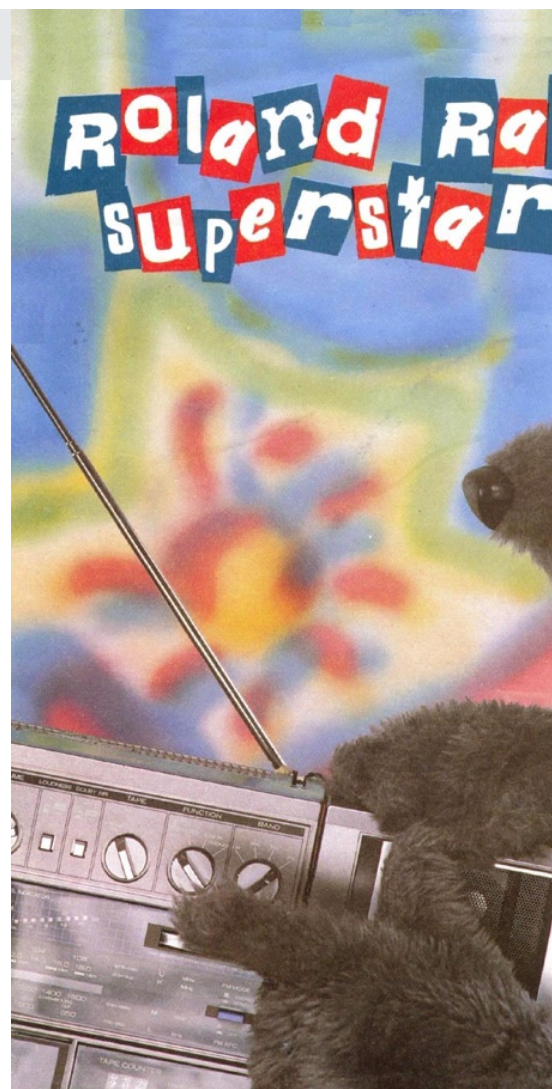




# REEL TO REAL

that gave a very satisfying clunk when pushed into position. Very different to the smooth touch interfaces we have today. It allowed you to play back shop bought tapes, but you could record things onto tape too. It gave me the opportunity to make some interesting electronic noises at a very early age. My friend Jamie and I decided to record an improvised Sci-Fi play, inspired having watched Star Trek. We would record the dialogue onto the tape, passing a microphone between us and have regular clunky pauses (as it takes a fraction of a second to reach the gear lever and for the motors to stop). We soon found the neutral selection which then meant you could manually rewind a few centimetres of tape to cut out the mistakes or end of conversation delay, mistakes etc. We didn't realise it but we were actually doing live inline editing.

Then we hit upon the idea of making a pinging laser noise by making a sound into the microphone and manually spooling the tape past the recording head by hand whilst making a noise into the microphone. Generally this made an awful noise as we made the mistake of trying to spool slowly to capture the sound, which meant when we played the quick laser zap noise, it turned out to be using way more tape and became a slow droning electrocution sound instead. Still we had our live editing technique to have another go and author the right sound. Above all it was great fun. We lacked the ability to make proper music so we just sung weird sounds as a "modern" theme tune too.



## All that scratching is making me itch

We had 'records' too of course, vinyl platters that spin under a small needle that picks up the variations in the pattern imprinted on it and made pleasing noises (or otherwise for parents in the age of Punk in 1977). I remember hearing about a new fangled way to make music using existing records on a BBC news report. A very posh accented news reader tried to communicate how people in America where using a new technique to create new sounds using existing vinyl called "scratching". Strangely they didn't play any, or if they did it did not sink in at the time. My





brain jumped to a completely wrong conclusion about what this was. My assumption was totally based on how I was using the reel to reel to make sounds. It was possible with the tape to wipe areas, to record over new layers, to mix sounds live and end up with finished result. I somehow thought scratching



meant a read/write vinyl surface. So you pushed down on the record and changed it live and left it physically changed just like my tapes.

Oh, how I was wrong. The vinyl and its mechanics, the physical nature of the medium meant it could become a live performance instrument. Far more exciting than just being able edit in the studio. It has also become a cornerstone of popular culture. Once I found out (that didn't take long once I thought about it) I also realised I should not make assumptions on new technology and trends based solely on how I think it should work.

Next along the line for me was being able to use cassette tapes and a record player in the very popular tower systems we had in the 80's. I never managed to get the 2 decks that has become the DJ's main instrument but I did get to play around with scratching and cutting a little bit.

Taking a vinyl record and using the pause and record on the tape deck to change what we had been given by an artist and have some fun with it. Not having the internet though these were very insular experiences with just tolerant close friends getting to hear it.

My favourite creation was based on Roland Rat, Rat Rapping. I was aiming for a Paul Hardcastle "19" effect, I was close (in my mind anyway). Whilst my obviously "wonderful" remix is long lost the original Rat Rapping can be found online. Go take a look, and remember rap was still new to everyone and kids TV is there to mess around with popular culture too. That was the 80's folks! If only I had Soundcloud then to save that tape for posterity.





# REEL TO REAL

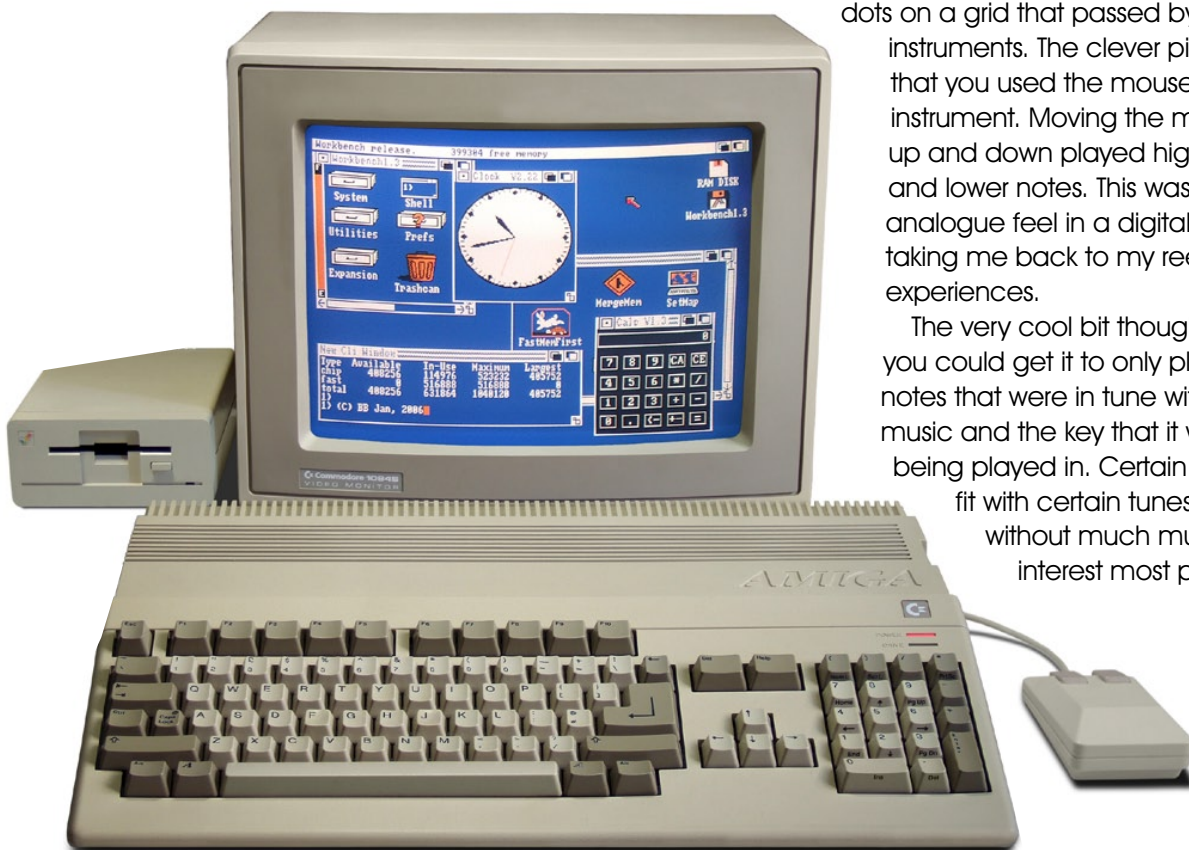
## Now! That's what I nearly call music

Synthesizers were all the rage in the 80's too. Suddenly electronic generated music and instruments became very affordable. Having things like a keyboard that could simply record a sound and play it back at different pitches was really exciting. Also home computers opened up a whole new way to make sounds. Editing software was very basic but you could, if you were a programmer (which I

am/was) write a specific program to play a tune. I did a version of Elvis' Wooden Heart complete with words and graphics on the C64. (Not very Punk but I had the sheet music for some reason and I was a Rockabilly)

One particular application that stuck in my mind that I really enjoyed was not so much an edit suite but a live performance tool on the Amiga (Commodore's computer that came after the Vic 20 and Commodore 64 in the late 1980's). It was called Instant Music. You can see the title is attractive to a would-be, but not quite musician with an interest in computers. The program (I nearly said App!) played tunes in a sequencer style. Notes were dots on a grid that passed by various instruments. The clever piece was that you used the mouse as an instrument. Moving the mouse up and down played higher and lower notes. This was a very analogue feel in a digital age, taking me back to my reel-to-reel experiences.

The very cool bit though was you could get it to only play the notes that were in tune with the music and the key that it was being played in. Certain notes fit with certain tunes. Even without much musical interest most people





will hear or feel discord in music.

It was a very rewarding experience, and felt very live.

It allowed musical expression in a genre straight away. It was instant, but of course it makes you appreciate those real musicians that can just do things, chose the right notes themselves. Nothing replaces that.

my iPhone. There are lots of similar apps but this one attracted my attention. It lets you take any tunes from your library and load them up. Having loaded one you can pick a second tune, but it will process the tune and work out the speed or beat of the song. It then lets you play one song and fade and mix into the other blending the two but they sound the same pitch and speed. It is very subtly making these changes. You get to isolate parts of a tune and keep them looping letting the other track

advance. There are a stack of other things you can do but this took me back to the creativity of the reel to reel. It is a live inline editing. Of course now having recorded something you can share it with the world. So my mash up Will.i.am's Bang Bang and Robbie Williams and Dizzie Rascal I Believe called "Bang, I Believe in Mash" made it onto Soundcloud.

## Mix it up, Edit it Down

Zip forward to present day. We have some utterly amazing pieces of technology to help us enjoy music and musical creation. I am by no means a musician, it is something that I still aspire to. Some of the things that are available now are a joy to tinker with though. It is probably as far as I will get, but who knows there may be a way to write a christmas number one or get in the charts after all.

I recently installed Tracktor DJ "Touch the Groove" on

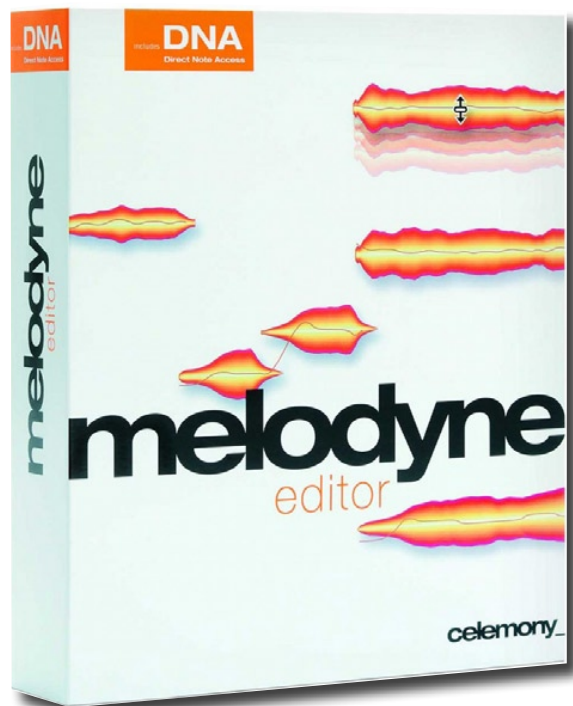




# REEL TO REAL

## Perfect Isolation

When it comes to editing performed music there is another amazing application, that I have only really tinkered with the demo of. It is called Melodyne made by Celemony. One of the key things this can do is some very clever mathematics and software engineering. It is able to look into a complex piece of already recorded music, with multiple instruments and sounds and isolate individual parts and notes. You can literally reach into a tune and move a single note. Most editing software is about the original source, each track is recorded separately, it may have even been recorded digitally. That makes it easy to adjust and remix. However an already recorded and mixed piece of music is like mixing multiple colours of plasticine together. You never get back to the pure colours you

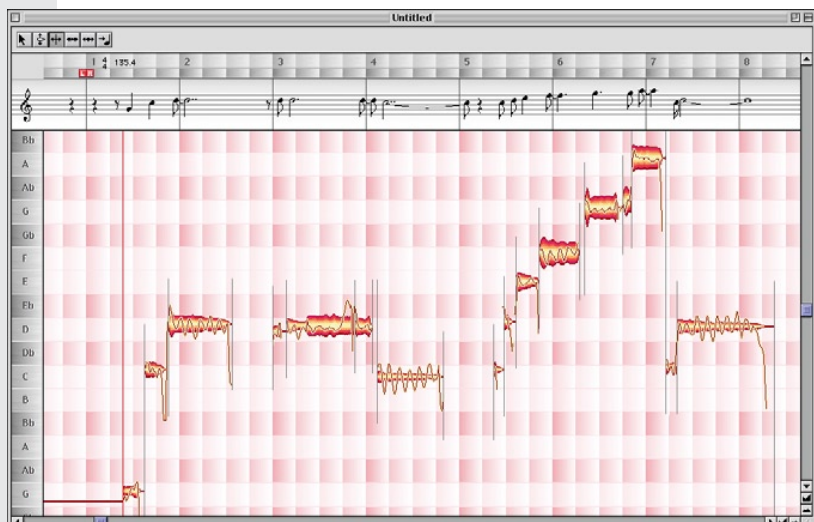


started with. Melodyne does the musical equivalent of reaching into the streaky coloured mess and let you adjust and edit it. Reflecting back on my reel to reel editing this sort thing would have been an fantastic addition to play with. Once a couple of sounds are mixed on tape thats it. No going back! You can only add or completely wipe it and start again.

## Now Rock it out!

Finally though, the pinnacle of software and music for me is the latest edition of Rocksmith. It is called Rocksmith 2014, it's Rockband and Guitar Hero taken one step further. Plug your real electric guitar via USB into the console or the laptop and the real version of real tunes present their notes to you scrolling past. You play the right notes and it detects you are getting good and adds more notes, levelling you up. It is a fantastic, fluid and dynamic learning experience for specific tunes.

The real star for me though is what is called Session Mode. I cannot understate how brilliantly cool this is. (Ubisoft are not paying me to say that either!). In Session





Mode you pick from a wide variety of instruments and styles it then shows you your scale on screen. i.e. the notes that work and will sound in tune quite like Instant Music did back in the 80's. The band are completely silent to start off with. You then place you fingers on strings, push down on the frets and strike the strings. As you do the band start to join in. This is not just a static backing track triggered by you starting to play. Each instrument and player in the band responds to how you play. Loud and fast, they join in loud and fast, slow and quiet likewise. They also throw in their own little improvisations. For the would-be musician in me this pretty much passes a melodic version of the Turing test. If a conversation with a computer cannot be told apart from a conversation with a human then an artificial intelligence has been created.

This feels like a real band. Here the music is of course domain specific, there are parameters. There are going to be ways to break it and confuse it. However for me it is almost witchcraft. It removes my tech brain in favour of a blues/rock/indie/jazz guitar player brain. It lets me experiment with music, get completely immersed, to play a real live instrument. I have learned an awful lot in a very short



time about what works, what goes, what doesn't. Names of scales and musicology that would never normally come across. I have gone from 'Reel' to 'Real'. So now can I go and create a christmas number one? Probably have to wait until next year for that!

**More Info: RockSmith**

<http://rocksmith.ubi.com>

**Celemony/Melodyne:**

[www.celemony.com/cms](http://www.celemony.com/cms)

**Tracktor:** [www.native-instruments.com](http://www.native-instruments.com)

**and... Rat Rapping - Roland Rat:**

[www.youtube.com/watch?v=QTOajyzvljE](http://www.youtube.com/watch?v=QTOajyzvljE)

**Ian Hughes is on twitter @epredator**

**The future can be found on his website**

[www.feedingedge.co.uk](http://www.feedingedge.co.uk)





# SECRET

## ON WHOSE SIDE?

by Ian Hughes/Epredator



James Bond has always been a fantastic near-science fiction reference for the use of technology in surveillance. Tracking the bad guys, showing early radio transmitters that detect direction and position, communications technology and wearable computing all feature heavily in the movies.

In 'Live and Let Die' and 'The Man with the Golden Gun', tobacco chewing southern state Sheriff J.W. Pepper was famous for saying those profound words "Secret Agent? On whose side?"

Recent revelations about the levels

of potential surveillance by large government funded organisations have caused quite a stir but it's almost impossible to say what is right and what is wrong. Do we have the right to counter measures to such technology, beyond any legal protection we have?

### TURN ON THE TAPS

Many films and TV shows feature the tense scenes where a phone call is traced to a particular place in the world. Inevitably there is a time limit between the call coming in, the

# AGENT?

wave of a hand to a technician to “run a trace on this call” and the person calling hanging up just before the trace could be located. The time limit to find the caller is arbitrary these days and digital phone exchanges, and mobile cells know what is where almost instantly.

We now also have the same principle for people trying to trace a computer connected to a network on the internet. With billions of devices able to connect anywhere over anything you would think it would appear to be tricky to actually find someone.

Not so. For two devices to connect they need to know each another’s ‘address’. If the data can get back and forth then so can a trace. You can even try this yourself.

Using the simple computer line command ‘traceroute’ or its variants will show you all the hops that a message takes over the internet to get to a url or a device.

As a military invention, the internet is designed to set up connections across multiple routes and route around failure after an attack. There are lots of ways to block such traces and hide locations. If you run a speed test on your home broadband you will often find it says you are somewhere else in the country at the main hub you are connected to.

Addresses can be masked and spoofed too. Servers can block incoming requests for traces and pings. The main aim of that is to

not give away too much information to a potential hacker. If hackers know your machine location, and what its running they have more opportunity to apply tools and techniques to get into them (or even just turn up at the actual physical machine).

I think in general we accept that the wiretap of a criminals phone line, authorised by a suitable warrant makes sense. In the movies it certainly helps provide tension. The battle to convince the judge or the Captain that the surveillance is needed, and then the physical act of clamping wires onto phone lines or sneaking in and placing bugs and transmitters in locations all adds to the excitement.

How many times have you seen a film hero turn on a tap to allow the flowing water to muffle any conversation? A low tech counter measure anyone could use. These days digital signals from wireless devices broadcast everything into the ether. Broadband information travels through routers and hubs around the world. When someone reads your digital data on the way past, there is no tell tale click on a telephone receiver to warn you of a tap.

Potentially any agency or

**WHEN SOMEONE  
READS YOUR DIGITAL  
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# SECRET AGENT?

## ON WHOSE SIDE?

organisation with enough influence can pretty much access anything as it passes by. We do of course have a potential defence against that. Enter 'Encryption'.

### ENCRYPTION IS THE KEY

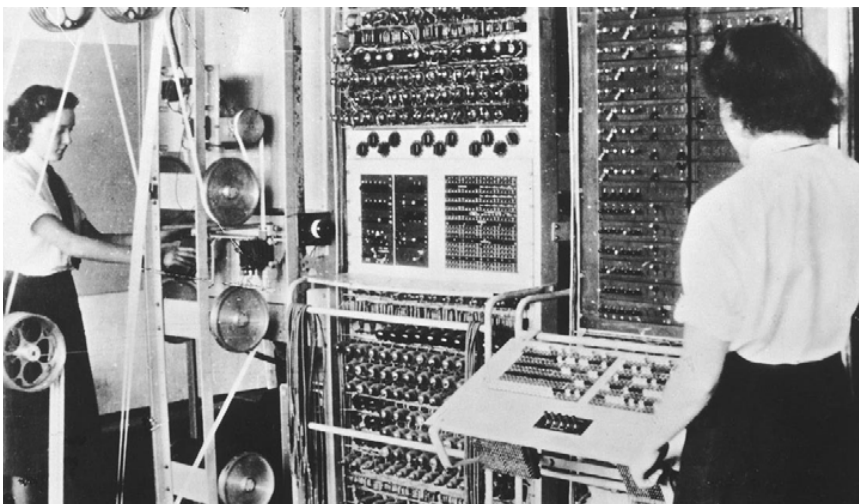
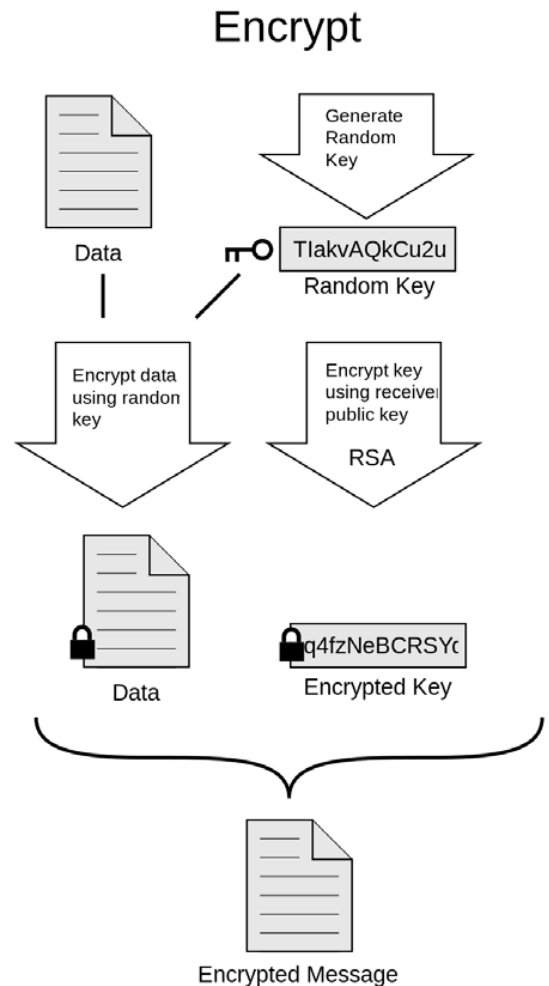
Data is just a series of 1's and 0's that is not information until it is interpreted.

We're used to SSL (Secure Sockets Layer) and TLS (Transport Layer) encryption, the little padlock that appears on your browser when you are engaging in a credit card transaction online.

Cryptography is what originally kick-started the computer revolution when the mathematicians and engineer code breakers at Bletchley Park in World War II attempted to break into the encrypted messages being sent by the German army.

It caused Tommy Flowers and Alan Turing et al. to build a number crunching programmable computer (Colossus) to rattle through thousands of permutations of codes to find holes in them to allow decoding.

Our SSL/TLS encoding and the way



keys are constructed keeps getting bigger and stronger, using more combinations to make things secret and avoid the counter attack of faster and faster computers able to rip through the encryption algorithm. For most people they will not have the computer power to apply any encryption techniques.

Some of them with current technology would take longer than the universe has existed to run the computations to crack a code. The obvious route for anyone trying to get



# CRYPTOGRAPHY IS WHAT ORIGINALLY KICK-STARTED THE COMPUTER REVOLUTION

# GETTING SHIRTY

In the early 90's,  
with concerns that  
anyone could be  
the target of surveillance

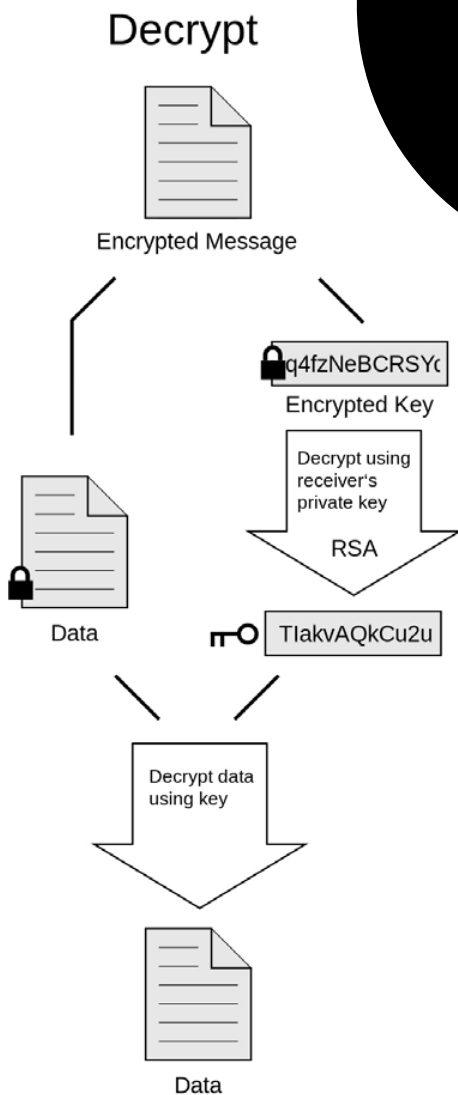
and access to their personal information would be compromised, the computing community created PGP (Pretty Good Privacy). This is a coded algorithm that meant anyone could encrypt, and then decrypt information, sharing access keys with who ever they chose.

It was a personal level of encryption and included applying that to the information on hard drives, or wherever it was stored. It almost instantly caused concern to some Governments. Oppressive regimes around the world saw that people were using it for free communication.

However, being invented in the US, for the US Government it constituted a weaponised technology that was illegal to export. PGP used 128 bits or individual digits to form the key. That offers  $2^{128}$  of possible keys which is about 3400000000000000000000000 combinations.

At the time the US defined any encryption that was over 40 bits, i.e.  $2^{40}$  which is about 1000000000000 combinations of key, was illegal to export software outside the US. The smaller the key the easier it is for a super computer to whizz through all the combinations and hack the encryption.

As you can see 40 bits is not much more than a telephone number. The inventor Zimmerman used an inventive approach to bypass the definition of software and remove the



at data is via some sort of backdoor.

One way is to have the equivalent of a skeleton key for the algorithm, to secretly mandate that in the standard definition, and enforce that across all the providers of services.

The other is to just get at the information either end of the transaction before and after is it encrypted and decrypted. Direct unfettered access to services databases. After all, if you are looking over someone's shoulder you can read what they read after all.



# SECRET AGENT?

## ON WHOSE SIDE?

electronic nature of it all by putting the source code in a hardback book and distributing it that way. The book was not software, and books were not part of the law.

This counter measure to the restriction also led to a people putting the core algorithm on t-shirts. It must have been of great annoyance to the powers that aimed to control encryption through law that the law itself was worded in a way that had not considered such old fashioned devices.

### A MESSAGE IN A MESSAGE IN A MESSAGE

The inventor of the peer to peer file sharing system Bitorrent, Bram Cohen is using another technique called Steganography in his latest invention.

The principle of this is to hide information in plain sight by adding the "secret" information to an existing message.

You have to know a message is hidden in another message or picture/audio file etc before even

trying to apply the key to unlock it. He

is also applying a recursive process where

a message is hidden in a message which is hidden

in message. The idea being if you have to give a key away under pressure there is no indication that there are even more message. It seems a valid countermeasure that I am sure will cause concern for

those that have the need to see the information.

We are back to considering who is good and who is bad, who has the right to see things and who doesn't. A moral minefield that is by no means a black and white decision. These are examples of, to use a famous internet quote, "all control is damage control". Everything has a countermeasure. It is clear though that good guys and bad guys now have access to considerable compute power. Governments are supposed to be there to protect their people.

However how many people do you need to gain an insight into in order to protect? The current answer would appear to be everyone and everything?

### MEET THE META DATA

If you were a government body tasked with knowing what was going on would you go to the effort of sneaking around putting bugs in places, tailing people in cars, or would you instead grab their electronic conversations, their emails, websites, instant messages, voice, GPS coordinates etc and look at those in detail?

How would you know who to look at first? The current responses to recent revelations seem to be not about the details but about the suitably generic description of Meta Data. Meta data is a fantastically amorphous description for a level of detail that is significantly less than the whole. We tech-geeks tend to inject these sort of terms onto the world.

If we translate this back to books, as with the PGP story previously, a book

**HOW MANY PEOPLE DO YOU NEED TO GAIN AN INSIGHT INTO IN ORDER TO PROTECT? THE CURRENT ANSWER WOULD APPEAR TO BE EVERYONE AND EVERYTHING?**





has a lot of detail in it. Before you get to that detail you have some meta data. A title, author and possibly an abstract. In addition the book can be classified in a genre, Fiction, Non-Fiction and within those in Science, Horror, Crime etc. You could take a glance at any bookshelf in a house (itself a collection of visual meta data) and see books in alphabetical order, or randomly mixed up. Another quick glance could tell you the majority type of book, is this a bookshelf of a philosopher, a scientist, a photographer?

It is all meta data.

Pieces of unrelated data that become information and insight when you combine them in context. However meta data can go deeper. If you open a book you see an index, chapter titles etc. That to is meta data, but you have accessed the book, opened it, engaged with it. You could even skim read a few chapters to form your own mental abstract of the contents. Again that is meta data.

To hear that in order to undertake surveillance just meta data is collected and saved, on everyone, everywhere appear to be the use of doublespeak to cover all eventualities. It is interesting that many politicians are enraged at being

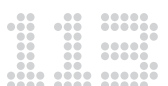
targets of such surveillance and data gathering and yet the general public are considered fair game and told "if you are doing nothing wrong you have nothing to fear".

I wonder if the various country leaders who have discovered they have had their data harvested, or meta data collected are told that particular line? I suspect not. Of course "wrong" and "fear" are like meta data, re-definable. Your fears may not be justified, equally the definition of wrong may change to encompass what you do or have done.

Either way we know all agencies and organisations that can collect data and extract information from you, will. We willingly give much of this to social media companies in return for free service to communicate and share with the world. They in turn can be hacked, either through illegal means or through political pressure and social engineering.

## **FOLLOW THOSE PIXELS**

In environments like 'Second Life' it is very easy to create new objects in the world in a shared space. Those objects might be a coloured box or a complex shaped device. People are logged in, gathered in a place or





# SECRET AGENT?

## ON WHOSE SIDE?

space.

They are there live, together, talking texting and more importantly moving and positioning themselves via their avatar. You can ask a group of people if they are with you over voice, and then some may answer in text "yes", or others may simply move to stand with you, silently.

The data that is flowing, even if interpreted and hacked it's so abstract and has so many combinations that unless you are actually there at the time, or the entire thing is recorded as a video rather than just the data, you will not be able to follow the conversation context or its outcomes.

During a particular period of time in Second Life I was asked if I could pop over "secretly" to look at some activity that may have caused some embarrassment or bad press.

I pointed out that I couldn't just turn up with my login/avatar and be unrecognised.

However to create a new account and turn up would be an undercover operation and that would, be dishonest. So it was with a chuckle, (though it is is actual quite serious) that I saw reports that security agencies were actually taking these environments as valid places to spy on individuals.

Reports indicate that there were indeed secret agents

logged into places like Second Life and World of Warcraft. It led the science fiction write Charles Stross to comment on his blog post (<http://bit.ly/1bxq8Eg>) that he now couldn't write a new future science fiction third part to Halting State as it was already happening for real "Sometimes I wish I'd stuck with the spaceships and bug-eyed monsters. Realism in fiction is over-rated." he said.

### THINKING INSIDE THE BOX

In many ways it seems fair game that transmission and mass storage of data in the cloud will be an accessible resource for agencies and hackers. Applying some degree of personal security makes sense. Using counter-measures, and the simplest one; just not sharing things that need to be secure.

Encrypting, but knowing that anyone with enough will, will crack the code is also a personal choice. You will notice I am a libertarian,

with a keen interest in emerging technology and it's

benefits. I do not take a stance that this all must happen, nor a luddite view to avoid the technology. Stopping those that seek to harm and steal is important, but not at the expense of all other rights. A sneaking fear of being implicated

**APPLYING SOME DEGREE OF PERSONAL SECURITY MAKES SENSE. USING COUNTER-MEASURES, AND THE SIMPLEST ONE; JUST NOT SHARING THINGS THAT NEED TO BE SECURE.**





Reports, are of a return to the old principle of breaking into somewhere and placing a bug. In this case though it is installing hardware and software into devices we use as they are being shipped to us. Or even more likely just building the backdoor surveillance in the fabric of the technology in the first place. It does not bode well as we approach a future with an Internet of Things, billions of small devices helping us, but also providing data and information to others in secret. Opening the box up and putting something unseen, undetectable inside is not very sporting at all!

Equally any backdoor has the

Will we end up looking over our very own shoulders and at the same time sending what we know and experience to people who want the information? Foil hats at the ready folks!

**Bram Cohen**  
**<http://bramcohen.com>**  
**Great Bond Movies**  
**<http://bit.ly/NsG6vS>**

15



# WE GO LIVE IN 3.2.1..

by Ian 'Epredator' Hughes

As in digital still images, the ability for anyone to record moving images and sound has gone through a revolution in the past few years. How we take them and how we share them (wait let me take a #selfie). Yes! We're in the midst of a video revolution, a revolution we already have the technology to support, one that requires almost no effort. All you need is a press of a button and a spark of creativity and inventiveness.



# WE GO LIVE IN 3.2.1.

## True Cut and Paste

In the 1970's regular non movie/TV people who wanted to capture films used wind-up or battery operated cine cameras using film based standard 8 and super 8 cartridges.

These (like the still images of the regular cameras) were sent away for developing to a chemist somewhere and then returned as 3 minute spools of film that you wound through a projector showing the pictures onto a silver screen.

You pretty much got what you filmed, editing was hard work and filming things you didn't need wasted some of that precious 3 minutes.

That didn't stop me trying editing of course. We had a little hand powered winder that allowed you to see each frame of film. An edit involved marking and cutting the precious original film, then rejoining it to an equally clean cut piece with transparent tape. The tape had to line up correctly and allow the sprocket holes in the film to still work. Getting it wrong meant the film jamming, and the projector build then melting some of the precious frames.

Editing however meant I could make our 3 minute home-movies into 15 minutes 'Blockbusters'. I tried to edit a selection of childhood memories together when I was 14. It came out as a 15 minute epic, but each reel was in the wrong chronological order (making a fore runner to Benjamin Button), I started older and got younger as the film evolved.

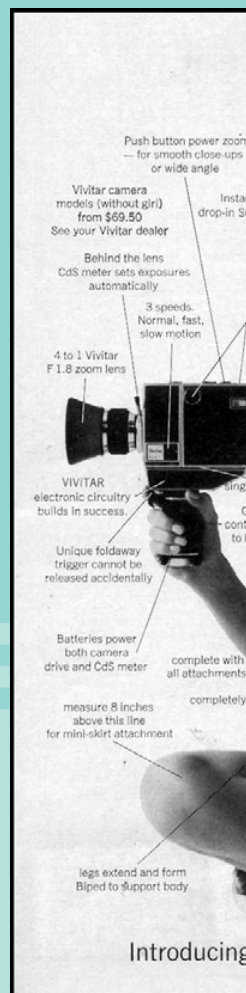


Editing is a lousy process, bits of film have to be trimmed and thrown away so I never did edit it back the right way. Another thing missing was the ability to repeat film. With only one source copying a scene for a home user was almost impossible. So no slo-mo repeats or funny falls or speedy bike rides.

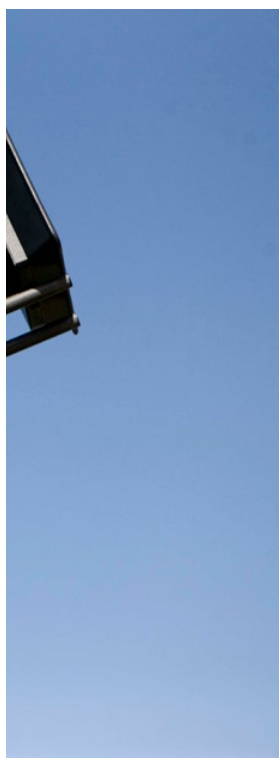
## Video Killed The Cine Film Star

When we had the first video camera revolution in the 80's we all ended up with camera's and tapes (of differing sizes and formats of course). The kit that meant we could record without sending away for developing. You could also afford to record several versions of something. If you could be bothered you could also stream the tape output onto a computer, using a video capture card and attempt to edit away.

This needed a pretty high-end (i.e. expensive) machine and a lot of time. Having revisited some old video tapes and tried this recently, it still does take way too much time. Of course even if you did edit things up, producing that interesting holiday movie you still had little chance to show it.







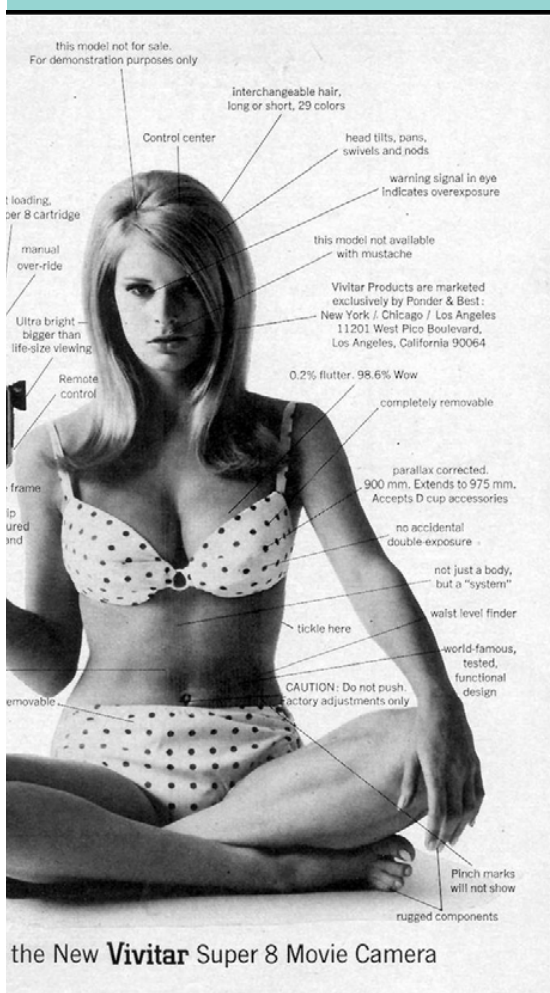
Again it didn't stop me trying. We took a Sony digital video camera out on Safari (as in looking at animals not the Apple web browser) during our honeymoon, last century. My wife was in charge of that whilst I had the old fashioned film camera and zoom lens. There was a lot of empty tape between the shots of animals, capturing everything as

option we had really. It is pretty obvious from the effort required to do anything at all with this footage that most people would not bother. Lots of people bought and used video cameras, lots of footage was shot, but most of it is still tucked away on tapes, slowly degrading.

## Going Live

Way back in 2007, a few of us tried to do a mixed media event as part of our work at Wimbledon tennis event. We used a mix of the virtual world Second Life as a way to be present with others, and had people all around the world live in there. We also broadcast the stream of the virtual world for people who could not get into the event. The event itself was a player interview. It was using Ustream, which was very new at the time.

This opens up a channel for people to log into on the web and lets the producer of the live show send a video stream from a device or source. We mainly had a video feed from the computer (showing the virtual world camera view), but we were also using live video fed into the virtual world and occasionally my Nokia N95 phone to stream live too to uStream. It was, as they say, Transmedia. It took a bit of thought, a little bit of technical knowledge and the willingness of guests to join in but it was pretty much a live TV show with some important extra viewer interactions. As with all these things if we, as a few interested geeks, could pull that off with home equipment and easy access web resources then surely it would follow that it would get easier, cheaper and more likely everyone could do it a few years on?



we drove across the plains of Africa. When we came home I did an old fashioned analogue edit. Playing the video camera output into a VHS video recorder and pausing the record as a got to bits we didn't need. We ended up with a decent enough wildlife show. I used the title text effects that the video camera could do to create the animal descriptions and place names. I also added an equivalent of a stop motion animation of the some of the stills I had taken at the end. Recording several frames on the video camera before swapping photos.

That then was added to the end of the VHS recording. It took a while as you can imagine. Once done I was able to run off copies using tape to tape. Each step lost some quality but that was the only

# WE GO LIVE IN 3.2.1...

## Cue Wobbly Video Fade Dream Sequence...

So here we are in 2014 and a new age of digital video content. Youtube is the big player. There are countless stats of how many videos are loaded, and enjoyed on that site. It has led to the creation of new stars in new genres too. Stampylonghead is one such gaming and Youtube star. His popularity has grown due to his use of Minecraft (and some other gaming platforms) as a place to make his shows. He has tremendous appeal with kids and is now



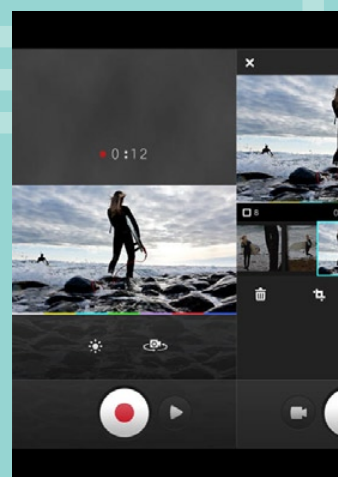
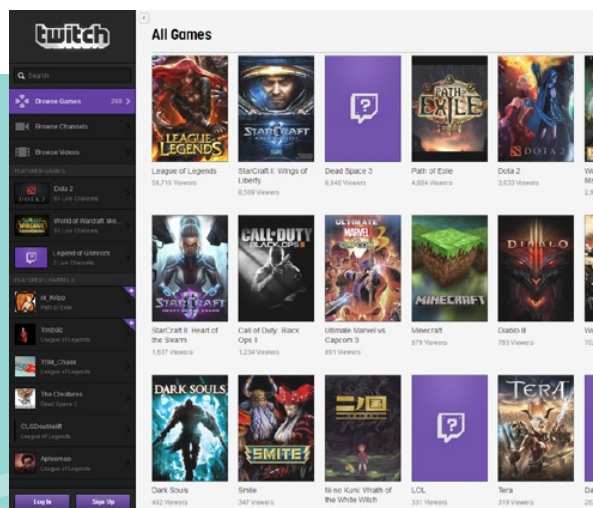
at the forefront of a new educational channel. I like to think I am up on popular culture, on advances in technology, but it was my own kids who told me about Stampy. He applies traditional editing techniques, spending time to craft his videos, but produces content every day,

Games themselves provide a very good source of video content, spectating on other players games is becoming

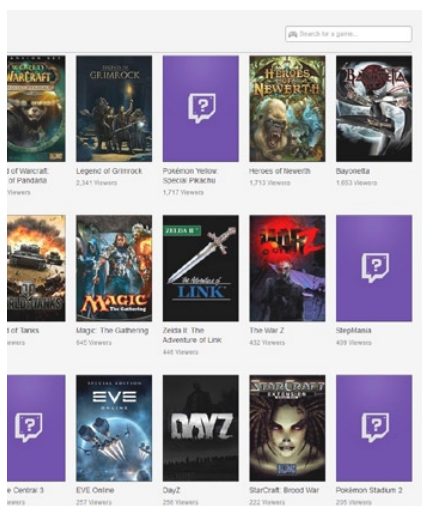
an integral part of the gaming experience. Games started to provide replays within the games themselves a few years ago. Standalone and multiplayer games all were giving the ability to re-watch and savour your experiences. Rather like the cine and video camera example though, this was only really for your own edification. Once games and consoles opened themselves to the social web, sharing of game achievements and of visuals started to explode. It has become part of the infrastructure of the latest consoles, the PS4 and the Xbox One, to be able to capture gameplay, record it and then share it.

On an Xbox One you shout "Xbox Record That" and any game you are playing will save video of the previous 30 seconds. These clips stream via a service called Upload and any of your friends, or other people playing the game can see your highlights. Some games trigger the record themselves when they consider

you have done something interesting, worthy or daft. There is scope to edit and to add a voice over or picture in picture commentary to the clips. It does not end there though! There are gaming streaming services such as Twitch.tv that for some time have provided the infrastructure to broadcast games as they happen. Players have their own channels, you can dive in and watch live with a meta chat room over the top







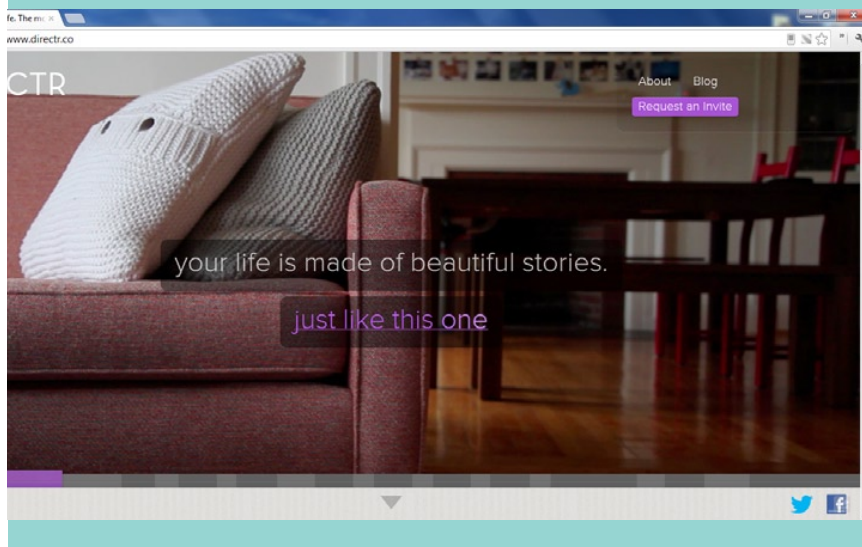
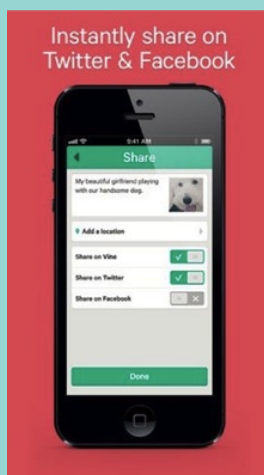
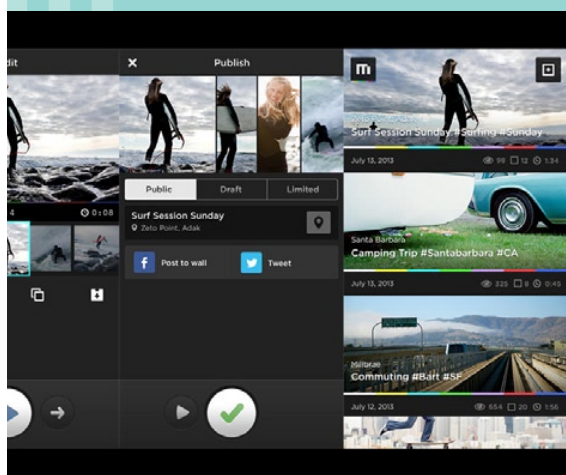
of the gameplay. This too is now integrated with the latest patch to Xbox One. Now you can say "Xbox broadcast that" and all your gaming output will be patched to Twitch.TV and streamed to the world. It is live, is it raw, it has a huge number of users.

Just like like TV people are working out how to produce interesting shows, the good ones will be in the minority, but it is democratising broadcasting. For the game companies it provides an incentive to keep the games great and with lots of content. The games are no longer just being seen by the people with the right console or who have bought the download. It is not just a demo that you get to play, you

see the whole thing. It has also caused the lawyers a few problems. There were incidences of players videos being issued 'take down' orders on Youtube for breach of copyright. That was not good for the game companies, despite them being the content owners. This was not piracy, this was people saying "look at this, its great isn't it, you should try it" a.k.a. free advertising. Of course the bad things get highlighted to, but that should promote positive good design in games.

## And Cut...

I would suggest it was probably Vine that showed lots of people the potential of more advanced video concepts, specifically on mobile devices. All our smartphones are great at capturing



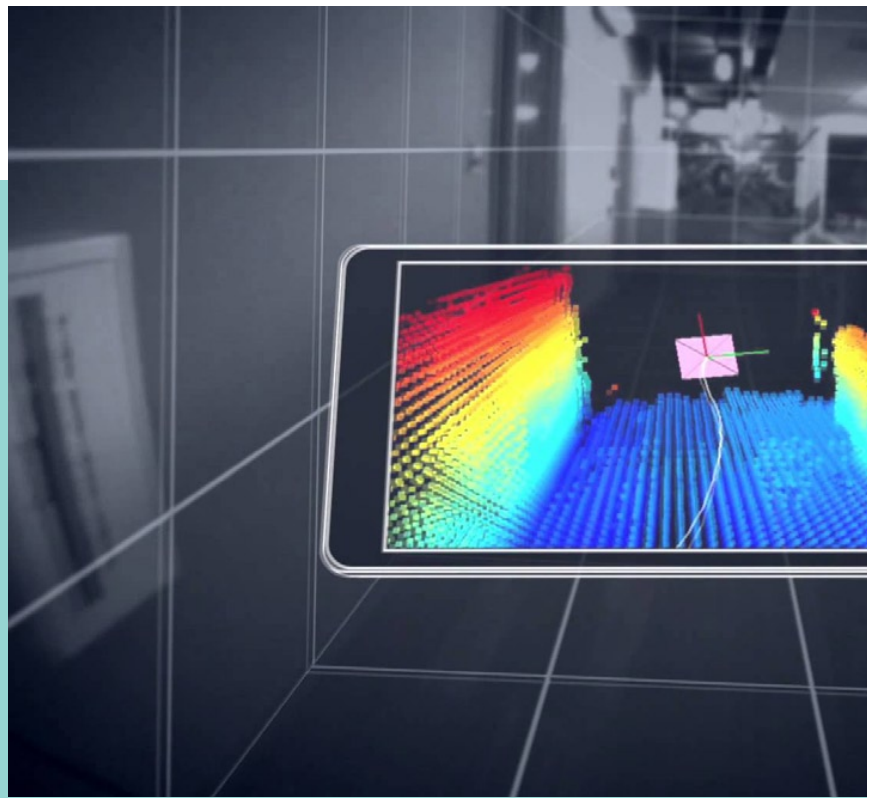
video. Just point the Vine app at something hold the button to record a bit of movement, let go and point at something else, hold to record again. You have six seconds to play with. Most people initially will just record a 6 second loop of one thing. However, the ability to stop the record, but then start with something else introduces the concept of editing and even of being able to tell a story in 6 seconds. It is seat-of-the-pants live editing, but with only 6 seconds invested it's easy to start again. The moment you finish the video loop is

# WE GO LIVE IN 3.2.1...

up on the web and shared, you have an audience for your near real-time editing. A number of other video editing apps are vying for our attention too. Directr, MixBit and alike are trying to tap into the creative process and be the next big thing. Directr is about providing storyboard templates and MixBit is about creating and mixing with other peoples videos to add to a conversation or story.

I've used iMovie on the Apple Mac a lot to create storyboard based mini-movies, just for fun. The trailer concept, as with Directr, provides a template to shoot something in a style. The pacing, soundtrack and titles all fit that style. It shows you the sort of shots you need to fill the template. Action shot, pan shot, single person, group etc. You can fill those shots from footage you already have or specifically record into the slots. iMovie is now also on the iPhone and it has become even easier to make one of these. On a recent roadtrip in the US I was taking a break from driving and made a mini trailer, as a bit of fun, for out 500 mile car journey. Later on on a visit to Atlanta aquarium I made another as I went around the exhibits, I was taking pictures and shooting video anyway as we all do. The Aquarium provides very high speed wireless internet to everyone. The video was uploaded as soon as I had finished the final tweaks. The simplicity to create, the freedom to combine and then the technology to instantly share, felt like the future had arrived. The clunky-ness of 7 years ago, trying Transmedia broadcasts had gone.

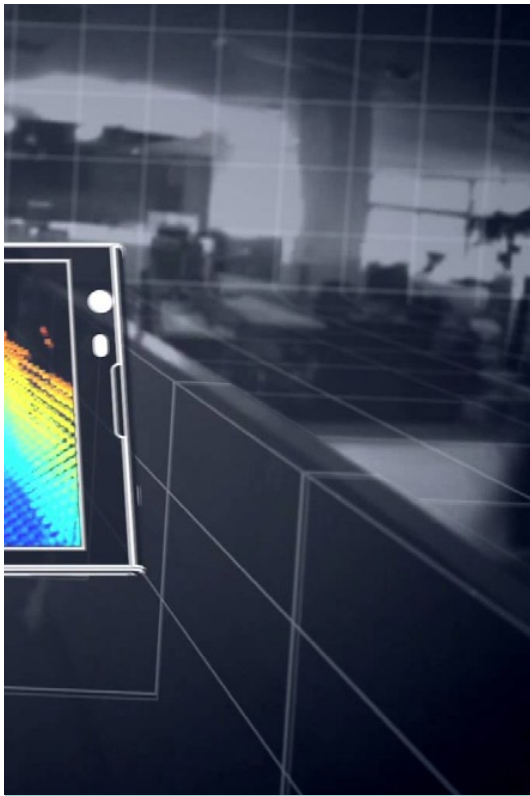
**Lets Do Another Take**



There is another interesting device on the horizon that may tie in even more with the original virtual world experience of 2007. Currently our video devices see the world as a series of flat pictures. A film is just pictures played one after the other. Virtual worlds and video games render those pictures, but from a set of digital geometry. 3D models provide the source material. Data that can be changed and altered. Already we have devices like Microsoft's Kinect that can see a room as a point cloud of data, known the angle of a surface, the placing of people in 3d space. These devices are often fixed in place though, living room devices. Google are working on a new device called Project Tango. This mobile phone style device doesn't just have an ordinary camera in place. It has a 3d scanner, that in real-time can see the geometry of the room or place it is in. This means if we shoot video in the future, the size, shape and place and people involved in that event will be captured as digital positional data too. This makes it possible to start viewing things from multiple angles or combine into game environments and sets. It also makes it possible to merge the visuals of the a digital environment with a physical one in very rich ways. It would be difficult to







## Further Viewing

<http://ustream.tv>  
<http://eightbar.co.uk/2007/06/13/pushing-the-wimbledon-broadcasting-envelope-web-20-is-web-do>  
<https://www.youtube.com/user/stampylonghead>  
<http://www.twitch.tv>  
<https://directr.co>  
<https://mixbit.com>  
<http://www.apple.com/uk/mac/imovie>  
<https://www.youtube.com/user/vepredator/videos>  
<https://www.google.com/atap/projecttango>

not bet on Google matching this sensor device with it's display device Google Glass. Other devices to view content like Oculus Rift, Sony Morpheus and alike need content to be produced in the way that game content is. Just as when you record video digitally you can do all sorts of edits and creative processes, so if you capture the entire geometry digitally there is scope for interesting applications, all of which can be shared live, or nearly live online.

## It's a Wrap!

Like all social media people worry that things that are put up are trivial, pointless, somehow lacking in gravitas. However if one thing you put up makes one person not with you, a friend or family member, smile or feel a bit more connected then why not?

The current media companies need to take note of a massive disruptive force in their industry. The disruption may not happen this week, but it is coming. There is a lot to be said for a well produced TV show, I was on one for 3 series with The Cool Stuff Collective so I speak with a bit of experience of the industry, (though only a little). It takes time, effort

and money to produce TV. Lots of commissioning politics and money from sponsors and advertisers floats around.

Just watch the mockumentary series W1A about the BBC to get a flavour of it all. However now there is so much more scope to interact with the audience, to allow them into the content of the show. New styles of program and entertainment are forming, and adding to the wealth of styles we have already. The simplicity with which anyone can produce video without any permissions, hardly any kit and reach a global audience is very exciting. I hope it also will help people understand the effort that goes into effortless looking quality production too.

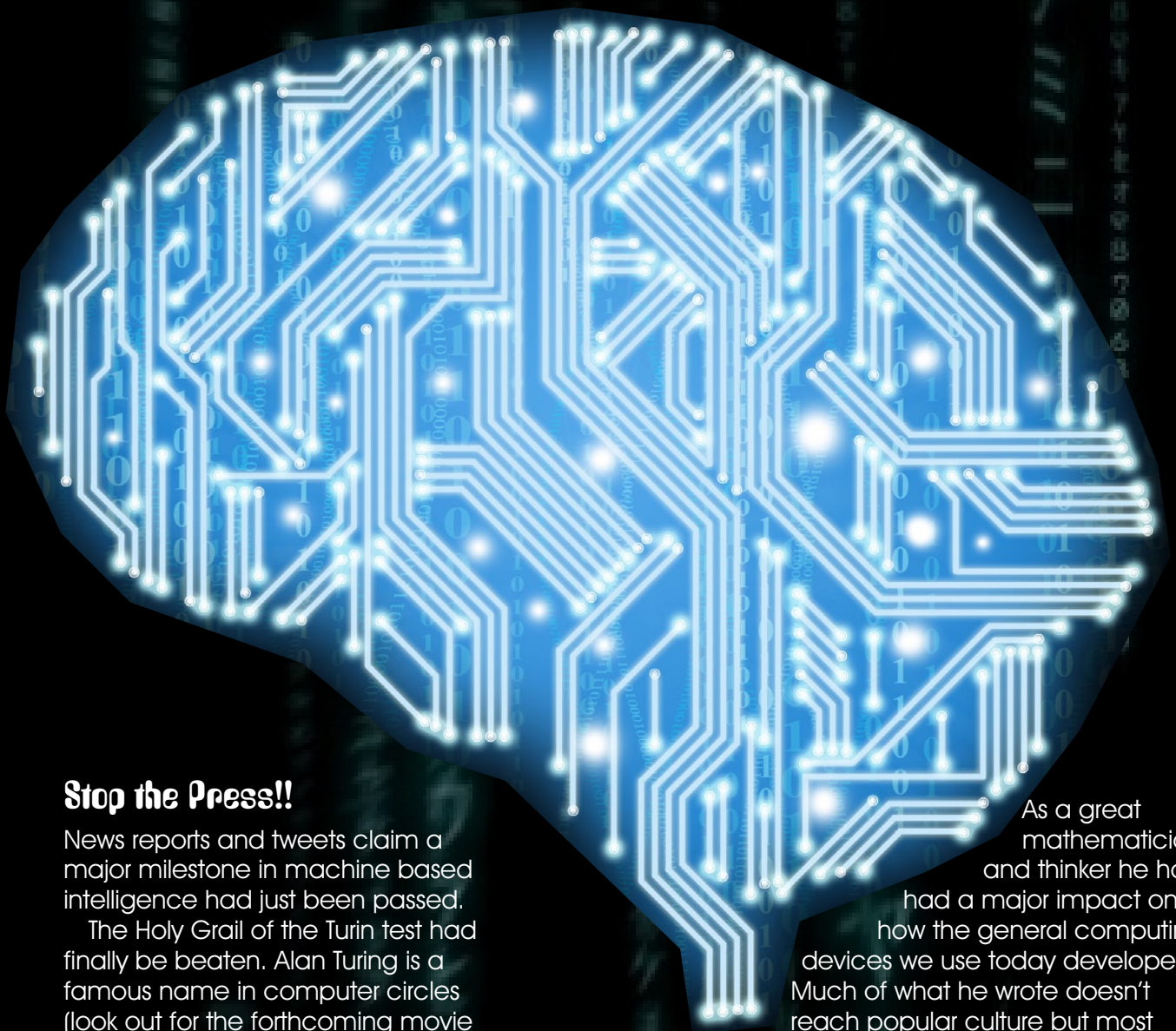
As with all much of the emerging technology we are all Makers now.

**Ian can be found on  
twitter @epredator  
The future can be  
found on his website  
[www.feedingedge.co.uk](http://www.feedingedge.co.uk)**



# Are U intelligent like what I am?

by Ian Hughes/epredator



## Stop the Press!!

News reports and tweets claim a major milestone in machine based intelligence had just been passed.

The Holy Grail of the Turin test had finally be beaten. Alan Turing is a famous name in computer circles (look out for the forthcoming movie starring Benedict Cumberbatch). He's well known from his use of revolutionary techniques during the Second World War using computing power (built by Tommy Flowers) to help crack German codes at Bletchley Park.

As a great mathematician and thinker he has had a major impact on how the general computing devices we use today developed. Much of what he wrote doesn't reach popular culture but most great scientists have the scientific equivalent of a comedy catchphrase that cements them into the fabric of society. Archimedes had "eureka" as his bath overflowed, Newton had the apple on the head incident, Einstein has  $E=MC^2$ . For Alan Turing it must



# Are U intelligent like what I am?

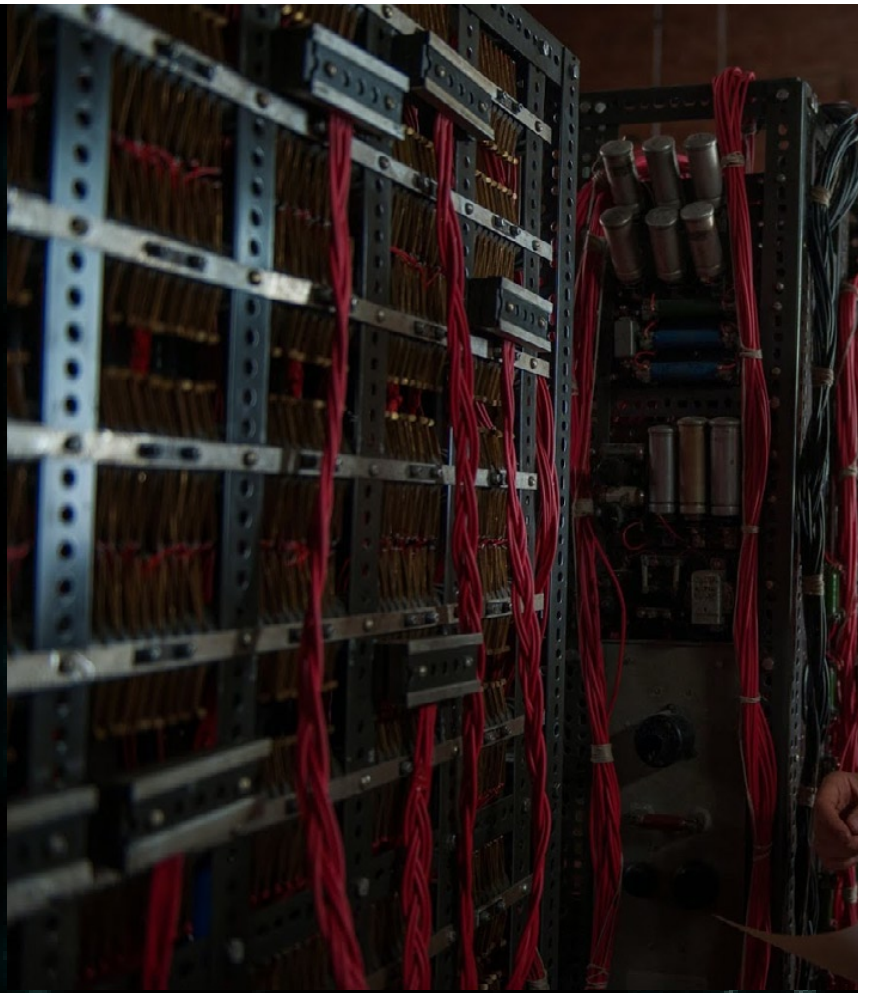
be the Turing Test.

That test, proposed by the great man in 1950 was to see if a general purpose conversational machine could be made. A conversation with this machine should not be able to be told apart from a conversation with a real person. He proposed that this be done using text and onscreen chat, obviously without any other visual or audio clues to give the game away. If it was not possible to tell the difference, then a major hurdle in artificial intelligence (AI) development would be met. If you cannot tell the difference during a conversation between a machine and person then we must have reached proper AI?

To quote Douglas Adams character Dirk Gently though "If it looks like a duck and quacks like a duck, we have at least to consider the possibility that we have a small aquatic bird of the family Anatidae on our hands."

## L33t Speak?

We often covered this subject and the deeper philosophical aspects of Artificial Intelligence when I studied this as part of my university course (in the late 80's). At that time it was quite rare for the general population to engage in text based chat. We didn't have SMS messages on phones generally available either. So in the 1950's this was even more far fetched and unknown. The difficulty in the Turing test was getting machines to understand the nuances of language. Using typed text gave us half a chance to build things as it removed the sort of body language and vocal intonation cues we feed



off as humans and channeled us into a domain more suited to data processing.

I'm not sure this was his aim, but clearly it was making the job a bit easier. It is and was a stepping stone. What was probably not foreseen was the way in which the rapid take up of text based communication has led to a change in language, a change



in the way we indicate meaning. The shortcuts and shorthand we use have evolved. We have ourselves codified some of our emotions in short text bursts. Emoticons and LOL's are there to save us time on the interfaces we use and we have adjusted ourselves to the machines and length of the message. A test





to see if conversational text based interaction with a 1950's person at the helm would be a much different prospect to a 2014 digital native engaging in social media chat. You may be expecting a polite exchange and full sentences more like a letter in a 1950's conversation. Today though, a much more random and short conversation would occur. "You just got pwned!"

Or even worse I33t speak - "1 M a Ar71F1C1al 1N73IL193nc3, And 1 JU57 pH00L3D J00"

So hearing the Turing test had been passed during a competition organised by the University of Reading, I was intrigued to see that it was described as a 13 Year Old Ukrainian boy who did not have English as his first language. I was then more surprised that in order to pass the test you only have to fool humans 30% of the time?

It seems that the program called Eugene Goostman convinced 33% of the judges at a specially



## EUGENE GOOSTMAN

THE WEIRDEST CREATURE IN THE WORLD

organised event in snippets of 5 minute conversation. That's 5 minutes of text speak style conversation with a 13 year old. I don't know about you but I am sure many parents would wonder sometimes what of earth their kids are saying in text speak. Most of it may also seem not quite the intelligent responses one would expect from humans?

I couldn't help thinking this was gaming the system somewhat! I was pleased to see a quote by Prof Noel Sharkey, an expert in robotics and AI, saying "It is indeed a great achievement for Eugene. It was very clever ruse to pretend to be a 13-year-old Ukrainian boy, which would constrain the conversation. But these competitions are really great to push developments."

## Something you get the wrong end of - What is a stick?

So the jury is out on whether the Turing test has been passed or is indeed a valid test now, given the criteria. What is not in doubt is that machine intelligence is advancing very rapidly. Understanding context and extrapolating meaning is a very high order function that we as humans are generally able to do. We may misunderstand or apply a different meaning to the one that was intended but we do much more than pattern match.

After all "Time flies like an arrow and fruit flies like a banana." This is classic example of semantics and the complication of language that takes some clever processing to work out. Here, IBM the company I worked for from 1990 to 2009 come in.



# Are U intelligent like what I am?

IBM have always pushed the boundaries of computing power, it may be creating one of the worlds biggest supercomputers or topping the league table with patents files across the technology industry (something I certainly helped with). In 1997 a computer and some software called Deep Blue (possibly a contraction of Big Blue which is IBM's nickname and Deep Thought the computer created in Douglas Adams's Hitchhikers Guide to the Galaxy) beat the world Chess Champion Gary Kasparov in a 6 game match. Kasparov had beaten the machine the previous year. Chess is not a game of pure logic, on the surface it appears it is. The number of permutations of outcomes and the ability to bluff and counter bluff in situations make it an interesting problem space. Deep Blue was looking around 8 moves ahead, sometimes up to 20, running 200 million positions a second according to public reports. The deeper you can look ahead the more confidence you can have



in a move, It appeared a random erroneous move helped Deep Blue luck out and made Kasparov think he was playing a human or a an intelligent being, just like a random ;) in a text message might do in a Turing test. Computer power has moved on since 1997, even in 2006 the software chess program called Deep Fritz was running on a regular PC looking at 8 million positions a second but looking 18 moves ahead.



So you can see the trajectory we are on for processing power.

Next IBM turned its attention to a different domain. The US game show Jeopardy. In this show contestants are given a clue and have to answer with the question. Clues like - Regarding this device, Archimedes said "Give me a place to stand on, and I will move the earth". In order to answer this question





correctly you have to work out what the meaning or the statement, know the fact or be aware of the subject and then come up with question that would create this answer. In this case "What is a lever?". Sometimes the clues are a play on words, other times they are facts or math problems. So IBM created Watson, this time named after Thomas J Watson IBM's original CEO (or was it?). In 2011 Watson managed to win the \$1million prize competing against former human winners. It still had trouble with clues that were short and required bigger leaps of the imagination but in general it won. This seems even more important that the general purpose conversation of the Turing Test. The really interesting point was that whilst Watson was built for Jeopardy, just as Deep Blue was built for chess, Watson is actually a general purpose collection of applications. It finds patterns and assess probabilities based on context. It was put straight into use in aiding clinical decision making. If you ever watched "House" you will

have seen fairly extreme differential diagnosis based on quirky, risky and very intelligent deductions by Hugh Laurie's Sherlock Holmes homage. Yes that's right... Sherlock Holmes and Dr Watson, led to the TV show 'House', a TV show led to IBM Watson that is now acting like a real life House!

## **"I'm Sorry Dave I Cannot Do That"**

In science fiction we are often reminded that machine intelligence may decide that it knows what's good for us. Even worse it may decide we are not good for it. In 2001: A Space Odyssey the ships AI decides it's in charge. HAL is the name of the system, a great play on words, as HAL is 1 letter away in each position from IBM. The entire Terminator series is based on Skynet deciding to wipe us all out. Skynet is not built as a sentient machine. It was described as a complex decision making defence system. It became sentient. There is a theory that used to be at the boundary of what was technically possible that if you put enough simple devices together they will start to operate like the over 100 billion neurons in the human brain and suddenly reach a critical mass and gain consciousness.

Some theories suggest we already have that with the internet and all the networked devices. They are already a sentient being, one that is so intelligent it doesn't even bother acknowledging our existence. Rather like us trying to explain to a bacteria who we are and what we do. It gets more scary than this though. Companies like IBM are already building machines with billions of simulated neurones,





# Are U intelligent like what I am?



## Be a Timelord (a rich one)

Sit down, relax and try this thought experiment. Newcomb's Paradox (Or Newcomb's problem).

A regular person (you) is playing a game against a super intelligent entity that says it can accurately predict the future. The player is given a choice based on two boxes.

The first box (A) is transparent and contains £1000, the other is not. The choice you make is based on these rules. The player can take both boxes or just the secret box (B). The super intelligent future predicting entity has decided what goes in box B before the game starts. Hence predicting what the player will do. If the prediction is that the player will take both boxes then nothing is in B. If the prediction is only box B is taken it will contain £1,000,000.

The entity is (almost) never wrong, so we can maybe take that as the fact that it will know what you will do. Take both boxes and you will get either £1,000 or £1m and \$1000. Of course the entity will have predicted you would do that so you will only get £1,000 as it will leave B empty. Unless you ignore its potential for being correct in which case you get the £1m too. B will only contain £1m if the entity predicts you will take just B. So take just B and risk it. If it is always correct you will not lose. If it predicts B it will put £1m in the box for you. Still with me?

Timeless Decision Theory (TDT) takes this a step further. The paradox of taking both boxes or just B are based on the fallibility of the infallible. So one theory is just take box B. This uses the idea that in order to become infallible the entity, or maybe a super

artificial intelligence, will need to work out what you are going to do. In order to do that it will simulate, like Deep Blue did with chess, all the possible options based on what you might do. It will do this in advance by actually simulating you. So you, as the player, may be an apparently sentient simulation of yourself. So if you always take box B then the simulation will always yield the prediction that the real you will take B and hence get £1 million. Remember you only get the big win if the AI predicts you will take B only. Once all the simulations of you have made it highly likely the AI will predict B every time then you will get £1m. Phew !

All this is a long way from the start of this article where Eugene Goostman will have typed LOL in short text message and confused an onlooker who knew that meant Lots of Laughs into thinking it was real, or confused a prime minister thinking it was Lots of Love and an old friend. Thoughts that we are in fact simulations ourselves seem like science fiction. Yet science is attempting to create sentient AI. At some point you would have to think the AI will wonder if it is a simulation or real. If it reaches that point it is of course real isn't it?

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### Further Reading

**Bletchley Park:** [www.bletchleypark.org.uk](http://www.bletchleypark.org.uk)

**Eugene Goostman:** [www.princetonai.com](http://www.princetonai.com)

**Kasparov v Deep Blue:** [www.youtube.com/watch?v=NJarxpYyoFI](http://www.youtube.com/watch?v=NJarxpYyoFI)

**Ian writes about the future on his website**  
[www.feedingedge.co.uk](http://www.feedingedge.co.uk)



# Get My Drift Digital Snow

BY IAN HUGHES / EPREDATOR

In certain parts of the world indigenous people have hundreds of words for snow. Those of us in rather less snowy climates tend to view snow as something magical or something we head to on a relatively expensive activity holiday. Snow is a complicated and fascinating part of life on this planet, it's a change in state of an essential element that keeps us alive. Therefore it makes sense that when we can't be somewhere snowy we like to play and experience it and its activities anyway.

## Scroll On

As a teenager I had a Saturday job as a shop assistant in W.H. Smith. It was when we had the initial influential wave of home computers with the ZX Spectrum and the Commodore 64 (ask you Dad). You may just view W.H. Smith as a newsagent or stationary shop but at the time it also sold typewriters, records and cassette tapes. These new fangled computer thingys had keyboards, so fitted with the displays of typewriters and they needed software that came on tapes.

Being a fledgling techie I ended up being the one wheeled in if a customer needed to hear some geek speak. Nothing new there then! One of the popular games at the time (1982) was Hungry Horace Goes Skiing (left),

this was a follow up to Hungry Horace, a Pac Man style maze game. The key part of this Horace (who was a large blue blob on legs) game was slalom skiing.

Now, the machines were very low power by today's standards and game design was still in its infancy. The entire screen was white with snow and a few obstacles and gates. Horace sat mid-screen and the gates scrolled upwards towards him simulating a slope. Pressing the rubber keys you turned Horace and he traversed left and right across the screen through a series of gates. It had that slightly out of control feel of coming down a mountain but the swoosh and swish of the skis was mostly imagined by the player. It wasn't just skiing. There was a level





that had to be completed before the skiing that involved trying to get across the road with your skis dodging traffic. It was basically Frogger, but it did fit with that initial trudge to the ski hire shop you get in most resorts.

I was inspired enough to go home and try to build my own skiing game. You quickly learn that just a few simple parameters can make for an interesting experience. Whilst this is a 2D experience the speed the gates scroll up the screen are acting like gravity and hence slope steepness. The turning speed of the player on skis can be made dependent on the slope speed. This gives a very analogue feel in a simple snow experience. Aside from this gravity drag there is actually very little snow simulation.

## Pick a Particle, any particle

The most notable next step in simulated snow for me was 1080° Snowboarding (top right) on the Nintendo 64 console. This 1998 snowboarding experience was a third person, hurtling down the mountain, pulling tricks game. The N64 had an analogue control stick which allowed large fast movements or small tweaks. The mountain environments were very well designed and had a realistic feel and depth. The most important factor though





# Get My Drift Digital Snow

was the snow. If you carved a tight fast turn a deep tracked curve was drawn in the virtual snow. It was accompanied by great sound effects too. It felt like snow, it was still a game not a simulation but it felt great. Of course much of this was graphical trickery and creativity. The trail left in the snow would have been an overlaid graphic not an actual cut into the virtual snow. There was often snow falling across the screen too and this was also using a now common programming trick.

Particle emission is a technique that covers a whole range of gaming effects and ways to combine graphics and code into nice effects. A particle emitter is a coding element that is given a small graphic or shape to define the particle and then has a number of parameters that determine how many copies of the image are thrown onto the screen. Are you still with me?

The parameters define how long the particles are shown before they disappear, and if they move or fly around. Using a game engine like Unity 3D it is now relatively easy to set up a puff of snow particles that explode out as a character walks on a snowy surface, or generate a snow storm on screen that blows left or right. Generally particle effects are a type of overlay on the screen. The particles are not really part of the world they represent, though they experience gravity. Using this technique the snow particles will not stick to surfaces or

interact with the environment. They do provide a visual cue and make an atmospheric statement that the human eye understands. The closest real world analogy is a firework. Each firework explodes in the sky and the small shards of burning material form a pattern then fade away.

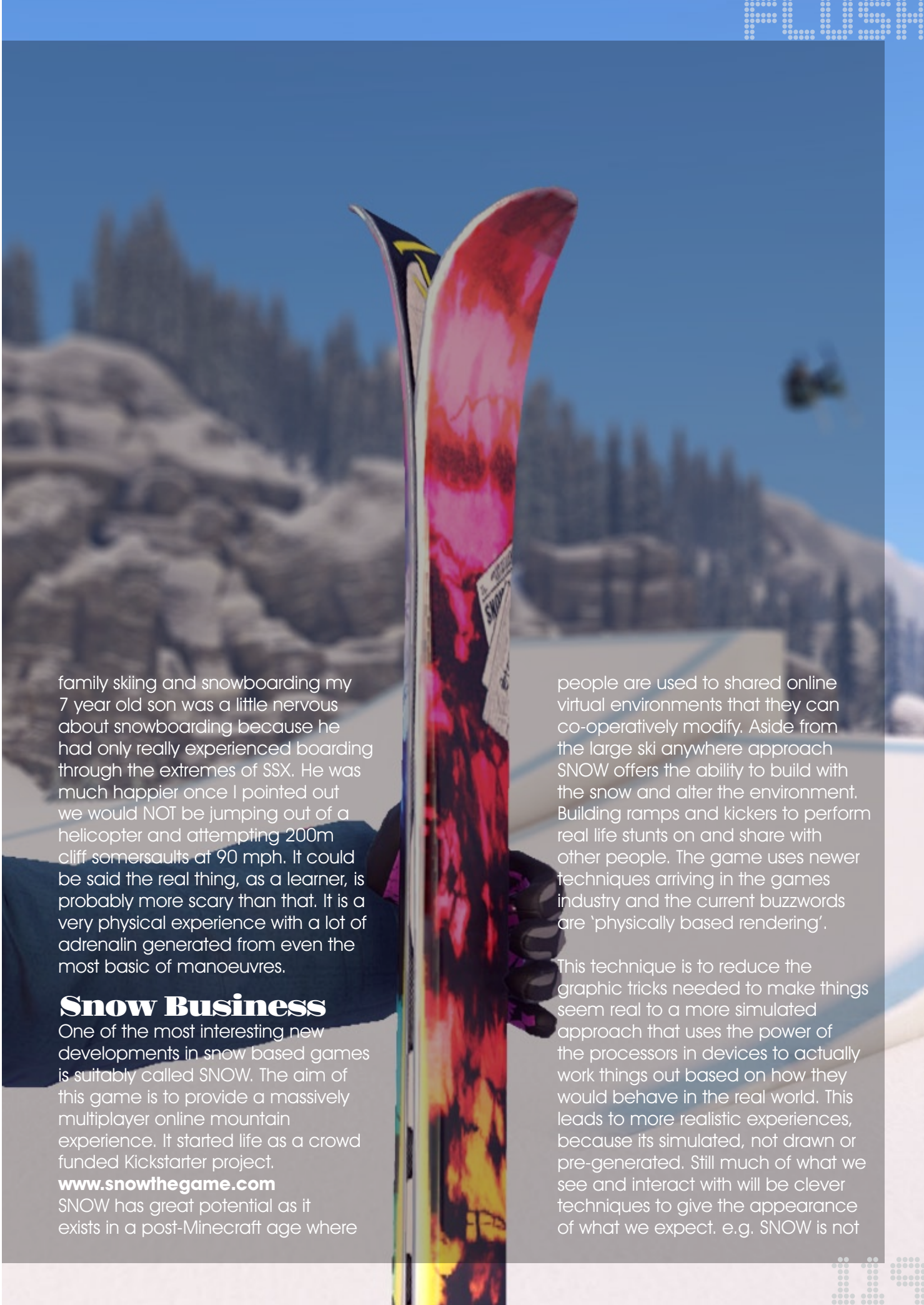


## Board Meetings

Games, as realtime simulators of mountains and snow, have continued to improve. We have over the top styles such as SSX. In SSX the snow has even more graphical depth than 1080° Snowboarding. It certainly doesn't focus on simulation though as there are superhero style flying tricks and big air. Even more particle effects are used with the glowing trails that the players leave behind as they spin. When we first took the







family skiing and snowboarding my 7 year old son was a little nervous about snowboarding because he had only really experienced boarding through the extremes of SSX. He was much happier once I pointed out we would NOT be jumping out of a helicopter and attempting 200m cliff somersaults at 90 mph. It could be said the real thing, as a learner, is probably more scary than that. It is a very physical experience with a lot of adrenalin generated from even the most basic of manoeuvres.

## **Snow Business**

One of the most interesting new developments in snow based games is suitably called SNOW. The aim of this game is to provide a massively multiplayer online mountain experience. It started life as a crowd funded Kickstarter project.

**[www.snowthegame.com](http://www.snowthegame.com)**

SNOW has great potential as it exists in a post-Minecraft age where

people are used to shared online virtual environments that they can co-operatively modify. Aside from the large ski anywhere approach SNOW offers the ability to build with the snow and alter the environment. Building ramps and kickers to perform real life stunts on and share with other people. The game uses newer techniques arriving in the games industry and the current buzzwords are 'physically based rendering'.

This technique is to reduce the graphic tricks needed to make things seem real to a more simulated approach that uses the power of the processors in devices to actually work things out based on how they would behave in the real world. This leads to more realistic experiences, because its simulated, not drawn or pre-generated. Still much of what we see and interact with will be clever techniques to give the appearance of what we expect. e.g. SNOW is not

# Get My Drift Digital Snow

simulating the entire depth of the snow on a mountain, it is a surface visual effect. It, and the other games, have to run a lot of code to keep things moving smoothly. Processor speeds and graphics capabilities have come a long way but still can't simulate snow exactly... yet.

## Let It Go, Let It Go

We get to see the sort of visuals we can expect in the years to come in realtime environments and games by looking at what the film industry is able to achieve. CGI films have the benefit of minutes or even hours of computational time per frame, unlike a video game that has to deliver a convincing frame every 50th of second. The Disney film Frozen has become a classic for many adults and kids alike, you hear the songs all the time everywhere now. However the digital simulation of the snow in the film is very important and is documented in an academic paper.

"A material point method for snow simulation - Alexey Stomakhin, Craig Schroeder, Lawrence Chai, Joseph Teran, Andrew Selle - 08/2013". The paper states that snow is difficult to properly simulate as it is a mixture of the both solid and liquid, both of which have ways of being simulated that are different. I was intrigued and wanted to figure out what they meant when they said they had "a user- controllable elasto-plastic constitutive model integrated with a hybrid Eulerian/Lagrangian

**Particle simulation allows each small piece of snow to have a size and shape and velocity.**



Material Point Method. The method is continuum based and its hybrid nature allows us to use a regular Cartesian grid to automate treatment of self-collision and fracture."

*\*The full paper can be read here:  
[https://disney-animation.s3.amazonaws.com/uploads/production/publication\\_asset/94/asset/SSCTS13\\_2.pdf](https://disney-animation.s3.amazonaws.com/uploads/production/publication_asset/94/asset/SSCTS13_2.pdf)  
for those of you who like maths symbols.\**

To summarise though, the key here is to appreciate the complexity of snow. It cannot be considered as a simple solid particle. Snow is not grains of sand. Each tiny piece of snow itself will deform and change shape and state based on what happens around it. The paper shows an approach that moves from particles(Lagrangian) to grids(Eulerian) and back to particles again in working out what happens at each discrete period of time or frame of the animation. Particle simulation allows each small piece of snow to have a size and shape and velocity. Grid systems allow for combined







forces to be applied and understand the whole collection of snow and surfaces in its environment. The particles are individual processed and evaluated. Then the grid calculations are applied to find combined forces, the method then returns to particles and calculates the deformation or altering of the individual elements of snow. This means a set of numeric parameters define the entire simulation. e.g very

cold snow will retain its ice shape more than slightly melted snow. The grid forces may be caused by the same event, a snowball hitting a wall, but the individual snow particles can behave differently based on the parameters set. This allows the animators to define how they would like they snow to behave, it gives it character.

## And Relax... Fresh Tracks

There are other ways to simulate snow and mountains that do not involve quite so much maths and provide a more direct experience, one we can feel. Indoor snow domes provide real snow slopes and have make their own snow. Snow machines pass water vapour into front of a cold air source which forms snow crystals and cover the surface of the indoor slope. Apparently, unlike an atmospheric snowflake each of the snow crystals formed indoors is pretty much identical. Real snow forms at a high altitude and each snowflake has a journey through the atmosphere that causes it to change and alter in unique ways, making each snowflake individual. Indoors they only fall a few meters and don't have time to experience these adjusting forces. For a long while we have had synthetic ski slopes too. These are usually a brush based surface that provides reduced friction to hurtle down. They can be tricky to learn on as it is not soft snow that you fall over on.

The other simulation that has arrived recently is the skiing and boarding equivalent of a treadmill. Companies like Skiplex offer an indoor experience based on an angled and continuous rolling carpet. The instructor controls the speed and angle adjusting to the riders ability. The rider stays at the same level in the middle and the mountain comes

# Get My Drift Digital Snow



to them, not unlike the principle of Hungry Horace Goes Skiing. The surface is not snow but is given an icy sheen as it is scrolled towards the rider. Interestingly because learners get to stay in a single place there is a rail that can be put across the slope. A new skier can hold onto a bar in front of them and have the simulated snow slope pass under their skis. With this technique you can have much longer runs than fixed simulated slopes. You can also pause and adjust when learning or improving. It is a physical trick to simulate many of the elements of skiing. It does lack the visual cues. Nothing gets closer or actually passes you by.

## Always Wear A Helmet

This leads to an obvious combination. Games and digital simulations give us a view of the world, they show us what the snow looks like and how it behaves. They

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show us where we are on a virtual mountain. They show us the trees, and give us a sense of speed. The SNOW game is starting to look at using Sony's virtual reality (VR) headset Morpheus (left) as it heads to the PS4 console. That means being able to turn and look around and not having a fixed forward view of the run. An experience looking to give your brain even more cues to convince it that it is real. Well why not combine the two? A rolling physical mat to ski or board on, and a helmet and goggles that are instead VR goggles. It is not an unusual concept to wear goggles when skiing and boarding, head protection is certainly much more prevalent now too. So the intrusion of a VR headset is not so alien for this activity as it may be for something like VR golf.

Matching your physical movements to a place in the virtual 3d environment (e.g. Kinect) could produce a very high end and convincing experience. You can also ride with people from all over the world as this can be a networked environment. Jumps and tricks may be a little more hard to deal with, but that's next on the list. This isn't something that you would install in your back garden but those of us not in snowy countries but still yearn for a quick ride down mountain would certainly give it a go. That just leaves the chilling wind to simulate, but as any 80's pop video shows, a lot can be done with a large fan and some dry ice.

See you on the virtual slopes!

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**Ian Hughes is on twitter  
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# Hello, are you Santa Claus?

BY IAN HUGHES / EPREDATOR

Ok, so I know not every culture has the notion of a jolly red suited reverse burglar, breaking into your home and leaving you gifts and it's not always connected with quantum physics, but Christmas is a significant world event that has attributes and insights into human nature and science that are definitely worth exploring.

Read on...

It starts around October with the Christmas songs on the radio, building to the fever pitch panic buying on Christmas Eve. However, as we get older many people realise it's better to give than to receive, and our focus is directed towards family, charity and general goodwill.

If you're aged seven and writing a Christmas list to Santa, those thoughts are usually not at the forefront of your mind. Coming downstairs on Christmas morning and ripping open all those gifts and maybe, just maybe, getting the absolute best present that you have yearned for drives your every waking moment. Everyone has experienced that feeling of surprise and elation of unwrapping just the right thing, not too mention the deflated feeling when the completely over the top





or hard to get hold of gift(e.g. a Ferrari) has not materialised? It made me wonder, is there someone, somewhere getting their dreams made into reality and do our seven years olds experience a Christmas version of the Schrödinger' Cat thought experiment?

## So, What's In The Box?

Schrödinger's Cat: The concept, which is now part of popular science, has a cat placed in a box with with a radioactive substance. That substance might have an atom decay and release energy into the box. If released that bit of energy in the box triggers a clicking Geiger counter. If that counter clicks it smashes a bottle of acid and poisons and melts the cat. It's a rather elaborate mechanism!

The box becomes a significant boundary for the experiment. We can't know what has happened to the cat until we open the box and observe the result. The decaying radioactive isotope is at the boundary of scientific prediction. The release of energy is based on a change of state that may or may not happen. There is a mathematical probability or likelihood it will. Like flipping a coin or rolling a dice. We don't know the answer until we see it. We don't know what is in our christmas wrapped gift box until we open it. (Yes I know, we can rattle it, prod it etc, but they are all observations).



# Hello, are you Santa Claus?

## That's A Bit Of Luck

We experience the world through our complex set of senses and process this in our ever-changing neural network brains. Our everyday experiences inform and indicate the likelihood of something occurring one way or another. From observation and experience it is possible to look at a large box, realise its very heavy and that you probably won't be able to lift it. Maybe there is a Ferrari in it?

The mechanics of the entire solar system let us predict that it will be morning, noon and night and where the planets will be in their solar orbit. At the edges of what we know we have to use either scientific methods to create and prove or disprove hypothesis, or use superstition and supposition to make sense of something. Probability tells us that something will happen, or not. It is a very pure piece of maths.

You have a 1 in 6 chance of rolling a four on a six-sided die. If you really want a four though, it somehow feels more unlikely if you are a pessimist or more likely if you are an optimist. The maths doesn't change, but the our concept of reality does.

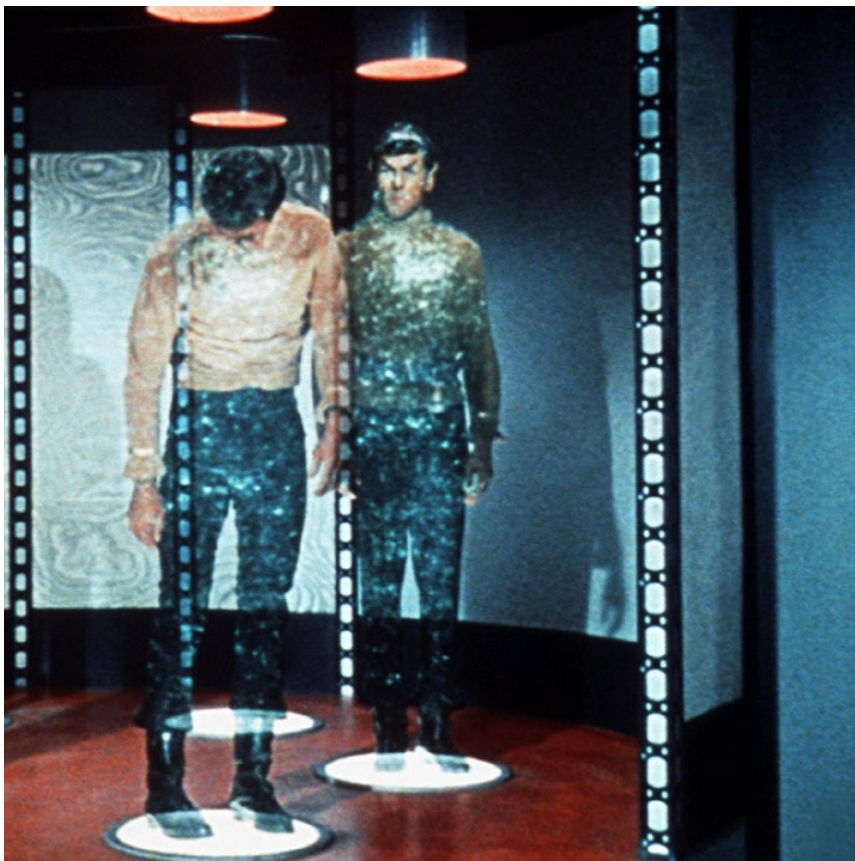
Quantum mechanics is the science of things at a level much smaller than atoms. It relies on the maths of probability and explores the problems of observation associated with those probabilities. This branch of science has something called the Heisenberg Uncertainty Theory. This suggests that combinations of



two physical variables of a particle cannot accurately be observed without affecting one another. You can't accurately get the position of something without altering its momentum and vice versa. I.E. to spot where something is precisely you have to stop it moving. If you stop it moving then how do you start it again once you have worked out where it is?

Fans of Star Trek will recognise the fictional device in the teleportation system called the Heisenberg Compensator. When teleporting people they are broken down into their constituent particles and beamed as energy to a new place where they are then reassembled. If scanning the particle means it alters the position or momentum of that particle then it would not be possible to get a fully accurate reading and accurately recreate the person at the other end. The Heisenberg Compensator is a nod to quantum mechanics as it is said to allow for these errors and offset them. So you are recreated with absolute certainty the same way as when you left. Uncertainty is a cornerstone of





It is a triumph of science and the human willingness to explore. Once it had been established that Philae actually bounced a couple of times in coming down to land and was resting a little skewed on the surface of the comet it was time for the science team to talk to the press.

At the press briefing there were some great scientific questions asked. However there were a few along the lines of "we need to know... what happens next?" I admired the restraint of the very tired team. One of them answered. We don't know what is going to happen next, that's why we are doing this.

the universe and that is based on chance or probability. In teleportation you really don't want uncertainty. Where all your particles are and their energy levels is a collection of probable outcomes, but you really need to roll that four or it could get messy!

### A Need To Know basis

Dealing with the unknown or lack of certainty can be tricky for us humans. The recent, and very impressive landing of the Philae lander on the comet 67P highlighted some of those tensions. I sat glued to the video stream from the control centre as we watched Rosetta separate from Philae and then had the anxious wait before the touchdown. 300 million miles away, under complete autonomy, after a 10 year journey we all waited to see if it had been successful. There was no fancy TV production, narration, cut aways or adverts. Just images of a group of people biting their nails, crossing their fingers and waiting. When the touchdown signal came through the elation was amazing.



So we (the human race) could predict the trajectory, know precisely where the comet was going to be from a mathematical model. Work out how long to fire engines for, even pick a spot 300 million miles away to land on. However, there were a lot of other variables, failures, awkward bits. Orbit calculations are relatively routine, but landing on an unknown surface wasn't. A 20 year project, in total, had to have a huge number of permutations of likely events all align in order to be successful. In this case it was. Despite the bounce Philae managed to perform all its experiments. It was in a slightly shorter





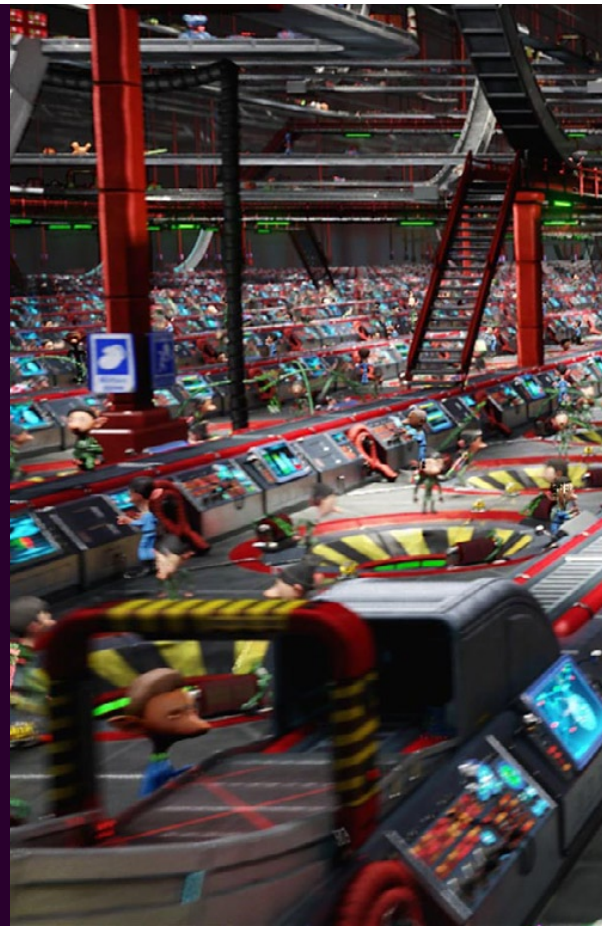
# Hello, are you Santa Claus?

time frame than initially planned, but now some hypothesis can be proved, disproved or new ones formed about our current universe. We do need to know things, but sometimes we do just have to wait to unwrap our presents.

## What About My Christmas Presents?

The good news is that everyone got what they wanted for Christmas (according to one set of theories). As a metaverse evangelist I tell people about virtual environments, show they can build and share ideas online. There is a branch of physics and philosophy theory called the multiverse, meta - universe or Many-worlds interpretation. It sounds like metaverse but is subtly different. The Many-worlds interpretation is one particular direction of thought on the multiverse concept, but it is almost self explanatory.

The idea was proposed by US Physicist Hugh Everett (interestingly also the Father of Eels frontman Mark Oliver Everett). The suggestion, in a very complex set of ideas, is that when something is on the brink of being true or false, like the cat in the box being alive or dead, the answer before we look in the box is - both are correct. So the answer after opening the box is also both. At the point the event needs to be resolved the universe divides. We



end up with one path of existence where the cat is alive and another diverged path where it is dead. Those now have no correlation or crossover. Both are correct. It suggests events like this occur, have occurred and will occur an infinite number of times with every quantum level piece of energy and means everything will happen, as much as everything will not happen. It means every decision you take will be played out in every combination somewhere by versions of you. There are even many







universes where versions of you aren't even in existence. The TV show *Sliders* used this sort of concept. It allowed the hero to slide between alternate universes for different narrative situations. That is not proof this theory is true of course, but it does illustrate a way of looking and the concept.

All this could mean that somewhere the seven year old you got the absolute perfect Christmas with everything you ever wanted coming true. The optimists amongst you will see a four being rolled on the die. For the pessimists, the fact that there are an infinite number of bad outcomes and sub-optimal christmas experiences happening could be a little worrying.

To our rational brains this seems all rather far-fetched. It hints of worlds we cannot know. It cannot easily be proved or disproved. One thing to consider; with an infinite set of worlds and possibilities

even the oddest of things will exist. So not only will you be somewhere getting your ultimate Christmas present, but you will also be a large jolly bearded man in a red suit able to deliver gifts to the entire world in one night. Travelling on a sleigh pulled by flying reindeer, one with a glowing red nose. You will be sliding down chimneys, leaving those gifts, knowing that everyone everywhere in your reality will be having a wonderful peaceful and joyful Christmas.

It's good to be an optimist!

**Ian writes about the future on his website [www.feedingedge.co.uk](http://www.feedingedge.co.uk)**

**Further Reading**

**Schrödinger's Cat**

[http://en.wikipedia.org/wiki/](http://en.wikipedia.org/wiki/Schr%C3%B6dinger%27s_cat)

[Schr%C3%B6dinger%27s\\_cat](http://en.wikipedia.org/wiki/Schr%C3%B6dinger%27s_cat)

**Rosetta / Philea**

[http://www.esa.int/Our\\_Activities/](http://www.esa.int/Our_Activities/Space_Science/Rosetta)

[Space\\_Science/Rosetta](http://www.esa.int/Our_Activities/Space_Science/Rosetta)

**The Many Worlds of Hugh Everett**

<http://www.scientificamerican.com/article/hugh-everett-biography/>

