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The Shape of Shit to Come

Written by
Steve Lowe and Alan McArthur

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THE SHAPE OF SHIT TO COME

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1

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INTRODUCTION

Are you ready to be innovated?

Are you ready for a world of kids making their own pets with gene-splicing kits? Or food that comes in packets that talk to you about how to cook the contents? While geeky types graft robot limbs onto themselves in a bid to become immortal before blasting off to their holiday homes in space?

You're not ready. Don't fool yourself.

The future was meant to come with a capital F – the genetic enhancements, the moon bases, the supercomputers killing all the humans . . . aaaaaaargh! – but then it didn't arrive. But a whole host of techy advances currently in development hell mean that this time, more than any other time, the future is coming.

Are you ready for the people trying to clone mammoths from frozen DNA? People you actually know – friends of yours – having sex with robots? The wearable computers?

Maybe you are ready for wearable computers. We'll give you that one.

This book started with idle curiosity about what was taking shape in the world. We suspected something was going down with technology. But a few peeks round the corner rapidly became a series of moments – shared here – of going: fucking hell – *really?* Our eyes widened, in fear and excitement, and stayed wide for ages.

As it transpires, out there on the fringes of public consciousness, nerds made rich as Croesus by the Internet are joining messianic scientists and military researchers in bringing some mind-bending things to pass. iPhones aren't even the half of it. The mad professors have got the keys to the genetically modified sweetshop. And we all know what that means. Except we don't – which is the point.

And while we're out front in the shop, trying to get our heads round the genetically modified sweets, they're in the back turning themselves into multi-bodied super-strength cyborgs with spooky telepathic powers. It's like they're always one step ahead of us.

In this super new world, it is hard to stay grounded. Even renowned physicists writing pop-science round-ups of current developments will veer madly between sober scientific inquiry and saying how it is our nailed-on 'destiny' to become 'The Gods of Mythology', and liberally pepper their writing with references to deities and superheroes. But this stuff is so nuts, it is no wonder the scientists start believing they are Thor (during the writing of this book, we too have occasionally had moments of thinking we are Thor . . . we actually might be Thor – can two people be Thor?).

In this book we sceptically scour the labs, the theories, the freaky cults, the Internet mega-corporateers who all ride scooters around, indoors . . . and ask questions like: don't all the people who go to space come back mad? Are GM crops such a headfuck because the people who make them are such utter bastards, yet the people who oppose them are such hippy mentalists? And also, how long will it be before we hear the tragic question: 'Mummy? Why is Daddy sleeping in the robot's room?'

Some of what is happening promises great things for humanity. Some of it promises the end of humanity. So it's worth paying attention. Otherwise we will leave our fate in the hands of adults who ride scooters indoors. They ride around on scooters indoors, but hold in their hands the power to change human nature itself.

What have we done?

CHAPTER 1: GENES

The mouse that did not roar, but instead made another surprising animal noise

This was no ordinary mouse. In January 2012, Japanese scientists announced they had genetically engineered a new kind of mouse. A mouse unlike other mice. Those mice squeaked. Not this mouse. This mouse went where no other mouse had, sonically speaking, gone before. This mouse tweeted, like a bird.

Lead researcher Arikuni Uchimura of Osaka University's well-named School of Frontier Biosciences said of the process that led to this fantastical creation: 'We have cross-bred the genetically modified mice for generations to see what would happen.'

That's right: they wanted to see what would happen. And what did happen? A mouse tweeted like a bird. It's fucked up.

Biotech – which is short for biotechnology, which is short for biological technology, which is not short for anything – is running wild. The building blocks of nature are a minefield. And the minefield is on fire. Not a day goes by without a headline like 'Genetic breakthrough could slow – or halt – the ageing process' or 'Why hating brussels sprouts could be in your

DNA' or 'Glowing Cats Shed Light On AIDS'. (I deliberately didn't look at that last story – preferring my own reverie.)

The mysteries of life itself are being unravelled before our eyes. Think of the ramifications, and also the implications. We are gaining the ability to mess with human genes – possibly changing characteristics, for good or ill, for generations to come.

Some call this playing God. But why should we not play God? Why should He have all the fun? Maybe He was wrong in having the mice squeak and birds tweet. Maybe it's time to mix that whole game right up. From now on, maybe we should treat mice that merely squeak with the disdain they deserve.

But who gets to play God? Many bleeding-edge geneticists have a sort of punk-rock DIY libertarian aesthetic that favours posting gene codes on the Internet so anyone can knock up new strains in the garage. It's a world of out-there ideas. Veteran future-watcher and renowned Princeton physicist Freeman Dyson believes the biotech revolution will be fun, and educative: he believes we should welcome gene-splicing kits in the homeplace. He even joyfully envisages biotech kids' games 'where you give the child some eggs and seeds and a kit for writing the genomes and see what comes out'.

See what comes out? *See what comes out?* I'll tell you what'll 'come out' of giving children the power to bend nature: a catalogue of horrors, that's what. Jurassic Park? Jurassic Fucking Reindeer-Shark, more like.

What can we learn from the really weird animals?

Like latterday Dr Dolittles, life scientists seem to want to talk to the animals, by making animals that talk. Or at least, animals that glow in the dark.

Life science has acquired an odd public reputation – forever synonymous with importing rabbits and mice on ferries for kicks. But the life scientists are certainly getting up to some pretty intriguing experiments. Most experiments are, when all is said and done, tedious as all hell. But these are *experiments*. It's like they're on E, but with the 'E' standing for 'Experiment'. Or 'Extreme Shit Being Done With Animals'.

Scientists in the Netherlands have injected cows with the protein lactoferrin derived from humans. Found in breast milk and tears, this little bit of *Homo sapiens* would allegedly help boost cows' immune systems. (Cows swimming with human tears? It's already happened.) Goats on a farm run by Utah State University have been genetically modified with spider genes so they produce silk in their milk. You think it's milk, but no . . . it's silk! Or, at least, silky milk (milky silk?). Then there is ANDi, the world's first transgenic monkey ('transgenic' means combining genes).

ANDi, whose name contains 'DNA' backwards, was born following experiments conducted by researchers at the Oregon Health and Science University. ANDi was no common or garden transgenic monkey: he was a transgenic monkey with some jellyfish DNA spliced into him. That is, jellyfish DNA was cut and pasted – literally – into monkey DNA. If you hold a torch up to ANDi, he glows a bit green.

So on some levels these animal experiments seem quite mind-bending, and on others a bit silly. In choosing to create a chimerical mythic creature anew the scientists eschewed classical models like the Chimera itself – lion, goat and snake – in favour of a slightly fluorescent monkey. (Of course, slightly fluorescent monkeys could easily lead on to slightly fluorescent human beings: not just useful for finding people in the dark, but also fun in the bedchamber.)

What the scientists love most, though, is fucking up mice. Everyone remembers the most famous transgenic mouse, the so-called Vacanti mouse (named after its inventor, the MIT professor Charles Vacanti), burdened with what appeared to be a ruddy great human ear on its back. This mouse had a ruddy great ear on its back, but couldn't even hear through it. So that's odd. In a full-page *New York Times* ad one anti-testing group labelled this striking image 'an actual photo of a genetically engineered mouse with a human ear on its back' – which was actually incorrect. The 'ear' was just cartilage grown into the shape of a human ear, although you can sort of see how this misapprehension might have taken hold, what with it looking like a mouse with an ear on its fucking back.

Anyway, transgenic mice are everywhere. In 2007, biologists in Cleveland conjured up a so-called 'super-mouse' that could run six kilometres without pausing for breath or sustenance. That's one hell of a useful mouse. It could carry very small packages or messages on paper. Hang on, there's e-mail for that. It's useful. It'll come to me . . .

So-called 'smart mice' have been engineered at Princeton. Altered with an extra gene that boosts the neurotransmitter NMDA (N.B., not MDMA – that would be a different

experiment entirely), the mice get a brainpower boost and outperform ordinary mice in various mouse-cleverness tests. Sadly, they also scare more easily. Meanwhile, Larry Young at Emory University transferred a gene from the monogamous prairie vole into the hitherto promiscuous lab mouse – and created monogamous mice. So there's *a lot* of stuff going on with mice. Less shagging around, in one instance.

But this is not just mutants for mutants' sake (not always). Some of these experiments on animals are showing humanity a brave new dawn in the here and now. Geneticists also based in Cleveland are producing transgenic mosquitoes that do not carry malaria, which in Cayman Island trials have started squeezing out mosquitoes that do. So that's good, because malaria is bad.

Then there's using animals to develop stuff useful for humans in a more direct way – by means of xenotransplantation: the breeding of animals for harvesting organs to transplant into humans. Renowned fertility expert and television star Lord Robert Winston is working on breeding GM pigs whose hearts can be transplanted into humans.

The heart of a pig is about the same size as the heart of a man. If liberally covered in human protein, it may be accepted by the human body. And, okay, it sounds wrong – putting the heart of a pig into a man. But is it wrong? Clearly it is. But is it? It's the heart of a pig. But they're putting it into a man. Is that wrong? There are risks for safety in all of this (no, really) – for example, of contracting animal viruses. Plus it might make you go off sausages, which just isn't worth the risk. (Maybe this is why Robert Winston is so twinkly eyed on the telly: he has just been bending nature on the sly.)

Even the supermice could have human applications. The Cleveland mice lived longer, ate more without getting fat and had more sex; some humans might also want to live longer, eat more without getting fat and have more sex. Could not supermice lead to genetically enhanced *supermen*? The researchers said that was not the aim of the project, before pointing out that humans do also possess this highly active gene for an enzyme called phosphoenolpyruvate carboxykinase (PEPCK). 'But this is not something that you'd do to a human,' said Professor Richard Hanson of Cleveland's Case Western Reserve University.

He has not even thought about it. No way. Not even once. Going down in history as the creator of a new breed of superbeings has never even begun to occur to him. 'It's completely wrong,' he added.

(He can't stop thinking about it.)

Anyway, one group of scientists is making mice monogamous, while another is making them randy. And that is what experimenting on animals is all about.

We want to help you overcome your genes

Many are calling the twenty-first century the century of biology. Mainly it's the biologists calling it that. But they do have a point. The century began with a bang, biologically speaking, with the rough completion of the Human Genome Project (HGP) – 'biology's Apollo landing' – in 2000. Large-scale messing with your actual humans at a genetic level came one huge step closer with the mapping of the human genome (all the genetic info in a person), aka the Road Atlas of Man.

It was a hell of a thing. Even just reading out the entire code (some 3 billion DNA base pairs, or 23,000 genes) would take about twelve years – so don't do that. This achievement was announced with great fanfare by then US-president Bill Clinton, a fervent supporter of the efforts – and he had more to fear from genetics than most, having totalled his presidency by spilling some seed on an intern's dress. 'We are learning the language in which God created Life,' he said. (About the HGP, not while he was getting off with Monica Lewinsky.) (Although maybe then too.)

So what have we learnt? We already know that cauliflowers contain more genes than humans. So having lots of genes isn't everything; no one is claiming cauliflowers have anything approaching human consciousness (there is nothing cruel about cauliflower cheese). But mainly what we have learnt is that we still have much to learn. We have mapped the human genome, but we don't know how most of it works. We are trying to find the secrets written in the DNA. It's like runes, man.

The HGP cost \$3bn, which is a lot of money. But the costs are rapidly falling for having your own genetic code sequenced (it currently costs over £2,000). So you are now able to have a much better idea of how you will die (cancer, Hodgkinson's, Parkinson's . . .). So that's nice. But then, there is also the prospect of targeted medicine. As the price of mapping genes comes down, you could get drugs optimised for your particularities (people respond to drugs differently); so-called pharmacogenetics. You could even treat an illness before you get it. Treating diseases you don't yet have – it's the future.

Mapping everyone's genome raises questions of privacy, of course, and who gets access to the info. For employers,

genetic discrimination could become a new type of discrimination to replace some of the old ones, like skin colour. Or the insurance industry could refuse to insure those at genetic risk. And it goes without saying the world should always applaud any new opportunities for the insurance industry to turn a profit; they are our friends.

Clearly some genes have particular purposes – like the ones that make mice horny. Scientists are keen to work out what the various human genes do, and claim to have isolated numerous genes which supposedly make up our personalities, including the gluttony gene, the long-life gene, the psychopath gene, the susceptible-to-flu gene, the genius gene, the infidelity gene, the suicide gene and even the liberal gene. Imagine having all of those. It would be one hell of a ride, albeit ultimately tragic.¹

These efforts bring the fear that we will not just muck with genes to banish illness, but to positively engineer in boosts to intelligence or looks, or even personality types. Designer babies could be created by gene therapy – inserting genes into the cells of an embryo – encouraging or discouraging certain predispositions. This might be used to phase out cancer, or it might be used to phase out liberals.

Anyone trying to do either will face difficulties. Genes, unsurprisingly enough, work together in ways of fiendish complexity. Boosting up one seemingly positive gene might cause some unwanted side-effects; the Cleveland supermice were great lovers, yes, but were also highly

¹ In the near future, scientists also expect to isolate the down-in-one gene, the too-small-teeth gene, the Catholic-priest gene, the stands-slightly-too-close gene and, of course, the looks-a-bit-like-a-waiter-even-though-they're-not-a-waiter gene.

aggressive. 'Why this is the case, we are not really sure,' admitted Professor Hanson.

But for some, the potential profits are unignorable. In 2009, a Los Angeles clinic – LA Fertility Institutes – run by controversial IVF pioneer Dr Jeff Steinberg, offered would-be parents the chance to select their kid's hair and eye colours – making sure to offer no money back guarantee. 'I would not say this is a dangerous road,' Dr Steinberg said. 'It's an uncharted road.'

But a road that is uncharted is, by definition, a dangerous road because it is uncharted. You do not know whether it is a safe road or one that is beset by marauding blonde-haired superchildren who see you as a source of cheap fuel. That's the main worry here. And one that saw public opinion force Steinberg to, at least temporarily, withdraw the service. We weren't ready for the master race quite yet.

Strange about the Cleveland mice, though: you'd have thought a mouse that was getting it that often would be pretty relaxed. But that's genetic complexity for you.

Is all this genetics just eugenics under another name?

There is a question underlying all this genetical jiggery-pokery and that question is this: is all this genetics just eugenics under another name? Stamping out impurities in the human gene pool? Many are touchy about this kind of thing. If we did manage to phase a 'psychopath gene' out of the gene pool, would that not be a good thing? Or are you some kind of psychopath fan? Then again, mastering

nature to breed a race of supermen: isn't this just a teeny bit Nazi? It does sound a bit Nazi. It's probably the words 'master', 'race', 'breed' and 'supermen'.

The word genetics replaced eugenics as the name for the field after certain mid-twentieth-century embarrassments. The word 'eugenics' is derived from the Greek for 'good in birth' and was coined by Victorian polymath Francis Galton who believed inherited physical problems caused much misery. If we bred from the best specimens and made people happier and cleverer, life would be generally better. But the 'best' of humanity, it turned out, were the gentryfolk like Galton while the 'worst' were the urban poor, who drank and swore and wore clogs and suchlike. (He wrote some *hilarious* blogs about 'chav scum').

And it's not just Nazis who have been a bit Nazi about all this. By 1927, many US states had eugenics laws permitting them to sterilise people deemed 'imbeciles'. They rowed back from – but thoroughly debated – the idea of gassing people. In Britain, in 1913, the Liberal Government passed the Mental Deficiency Act which early supporters, like Winston Churchill, had initially hoped would sanction sterilisation of 'the feeble minded and insane classes'. The last time the USA sterilised someone was . . . 1972. (On US soil, that is; attaching electrodes to Iraqi nads doesn't count.) In 1995, good old 'socialist' China passed a law limiting the right of low-IQ people to reproduce.

So is all gene-related work essentially 'eugenics' under another name? Well, yes. But there is clearly a difference between hindering the spread of cancer and hindering the spread of alleged imbeciles.

We have moved on from Justice Oliver Wendell Holmes's jolly pronouncement about the twenties US laws: 'We want people who are healthy, good-natured, emotionally stable, sympathetic, and smart. We do not want idiots, imbeciles, paupers, and criminals.'

I mean, he's right in a way: who does want idiots, imbeciles, paupers and criminals? Not me. Not after last time. But most would now agree that fascistically stopping people breeding is not really helping anyone and the USA for one has a far more enlightened attitude to imbeciles – sometimes even making them president.

But trying not to slip into being a teeny bit fascist remains a big issue with genetics. Most are pretty careful to avoid muddying the waters, though this cannot really be said for James Watson, the American genetics legend who, with Francis Crick, discovered DNA in a Cambridge pub in 1952 and now runs one of America's leading scientific research institutions. In 2004, pondering genetic engineering's potential uses, this figurehead wondered if there was any harm in breeding 'pretty girls' (he *really likes* pretty girls).

More controversial was his contention that being 'really stupid' is 'a disease' that we could also try banishing from the gene pool. Still, at least he wasn't being racist or anything. Oh, no, hang on . . .

He also claimed that black people were less intelligent than white, which definitely sounds like the sort of thing that people call racist. Yes, he did acknowledge that modern science claimed all human groups were intellectually equal, but 'people who have to deal with black employees find this not true'.

Man alive.