



Everything is Connected to Everything Else

101 stories about 21st century Geography

by

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CHAPTER 8
TECHNOLOGY
AND THE FUTURE

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Paradise found.

Ah Bora Bora. The gentle breeze rippling the palm fronds. The pristine white sand beaches. The azure waters stretched across coral gardens. Yes, deep in the heart of the huge Pacific Ocean a little bit of France exists: French Polynesia, paradise with decent wine. Actually French Polynesia is not an island but a collection of 130 islands scattered across nearly a million square miles of ocean but it is the coral atoll of Bora Bora that has always caught my eye.

In the year that I was born, 1962, the brooding Hollywood actor Marlon Brando landed in Bora Bora to take the starring role of Fletcher Christian in the epic film *Mutiny of the Bounty*. He fell in love with his co-star Tarita Teriipa and the isolated island paradise she called home. He built a home so perfectly evocative of paradise, sitting as it does on stilts above the water of the coral lagoon and overlooked by the soaring volcanic plug of 2,385-foot high Mount Otemanu, that it is hard to imagine

anywhere so tranquil and disconnected from the hurly burly of the modern world. You would of thought so.

When I have invested my winnings from the Euro millions lottery in a suitable offshore tax haven I am going to escape to Bora Bora and rent Brando's bungalow. I am not sure how much it costs, as it is the sort of place where if you have to ask you almost certainly cannot afford it.¹ It'll be worth it to get away from it all. It even has Wi Fi.

Not only does Bora Bora have Wi Fi, it isn't simply an expensive satellite dial up system, but a state of the art fibre-optic cable running right across the Pacific Ocean from Hawaii. It finally came to the island in 2010 making it the most remote location in the world to be connected up to the global high-speed fibre-optic cable network.

There are a few other contenders for the most remote connection on the global high-speed fibre-optic cable network map. Majoro, one of the Marshall Islands, benefited from the US military running a cable to The Ronald Reagan missile test site stretched out across a series of remote atolls leased off this disparate Pacific Ocean nation.

Submarine cables have been the pathways of communication ever since a submarine telegraph cable was laid on the seabed of the English Channel between Dover and Calais in 1851.²

¹ Rental details can be found at <http://www.homeaway.com/vacation-rental/p330262>

² Watkins-Brett J (1857) 'On the Submarine Cable' Notices of the Proceedings of the Royal Institution of Great Britain Volume 2 1854-1858. Access at <http://atlantic-cable.com//Article/Brett/index.htm>

Today an ever-expanding network of predominantly fibre-optic cables that enable the digital world to be global crisscrosses the world's oceans.³ This is the technological infrastructure of the modern age and it doesn't come cheap. The 5-year project to lay 3,107 miles of cable from Bora Bora via Tahiti to Hawaii has cost £177 million and has to navigate ocean depths of up to 5,944 metres.⁴

The technology to complete such a Herculean task was provided by the French multi national Alcatel-Lucent who specialize in connecting up the world via their fleet of cable laying ships. It is difficult to turn a profit in this line of work. In 2012 Alcatel-Lucent posted a €1.374 billion loss and slashed 10,000 jobs worldwide.⁵ The company is considered to be one of the world's leading technology innovators and as evidence of that claim owns the world famous Bell laboratories in the USA where, over the years, staff have been awarded seven Nobel prizes for research. Research at Bell laboratories has generated 27,600 technology patents in recent decades.⁶

What Alcatel-Lucent are struggling with is the competition in this, one of the most advanced areas of technology globally, and one that provides the infrastructural architecture that links together the digital world. The competition is China.

The evolving global market in global communications to some extent reflects the debates about the relative roles of the state and the private sector in the economy of the real world. Simply put submarine communications cables are expensive in terms of capital outlay, have a low rate of return meaning that they are very much a long-term investment, and finally the protocols that enable the transfer of information between countries are set in place by national governments through regulation.⁷

In all these areas the state will always dominate. There is no free-market in global communications and the Chinese telecommunications companies China Mobile, China Telecom and China Unicom are all state owned enterprises. They raise capital from state owned banks and are guided by the hidden hand of the Chinese Communist Party. The world's largest supplier of submarine communications cables is also Chinese, Huawei, the Shenzhen based workers co-operative who turned over \$3.7 billion profit in 2013.⁸

³ For an up to date and authoritative map of the global network of submarine communication cables the website <http://www.submarinecablemap.com> From this source it easy to identify Bora Bora as, currently, the most remote location on the planet connected to the network.

⁴ Submarine Cable Networks (2010) 'Honotua Submarine Cable Landing on Big Island'. 01.03.2010. Access at <http://submarinenetworks.com/systems/trans-pacific/honotua/honotua-landing-on-big-island>

⁵ Musil S (2013) 'Alcatel-Lucent reportedly to reduce workforce by 10,000 jobs' Cnet news 07.10.2013. Access at http://news.cnet.com/8301-1035_3-57606440-94/alcatel-lucent-reportedly-to-reduce-workforce-by-10000-jobs/

⁶ Wikipedia entry for Alcatel-Lucent. Access at http://en.wikipedia.org/wiki/Alcatel-Lucent#cite_note-6

⁷ Winston Q (2014) 'Why Does It Turn For Chinese To Lead The Submarine Cable Industry?' Submarine Cable Networks 07.02.2014. Access at <http://submarinenetworks.com/news/turn-for-chinese-to-lead-submarine-cable-industry>

⁸ Huawei website Corporate Governance pages. Access at <http://www.huawei.com/en/about-huawei/corporate-info/corporate-governance/index.htm>

In the neo-liberal global economy such long-term foresight, such as investing in infrastructure with a long-term rate of return, would always be trumped by the short-term expediency of sweating rent out of capital to the maximum extent possible. In 2012 China invested \$60 billion in fixed capital telecommunications projects.⁹ There is little surprise that Verizon and AT & T the key US players in submarine communications are declining operators in this vital global market. Indian companies Tata and Reliance, although ambitious players, have struggled to come up with a private sector business model that works in such a research and capital intensive market.¹⁰

From Bora Bora to Britain global connectivity is at the heart of the new technologies that are driving the 21st century. Place still matters in the rush to physically ensure that everything is connected to everything else. From your hammock in the most geographically remote of locations you can shoot the breeze with your friends, family and business associates nearly anywhere in the world. Not quite getting away from it all.

Still, the Pitcairn Islands, where Fletcher Christian fled with the mutinous crew of *The Bounty* to escape the long arm of British justice, is still only connected to the rest of the world via satellite and that is only when the intermittent electricity supply works. Pitcairn is a place you really can get away from it all, although Pitcairn's beaches aren't a patch on those in Bora Bora.¹¹

⁹ Op cit Winston

¹⁰ Sunil Tagore's Blogsite 06.02.2014 'Yet Another Sign Of The Coming Crash in Submarine Cables'. Access at <http://blog.buysellbandwidth.com/yet-another-sign-of-the-coming-crash-in-submarine-cables/>

¹¹ Pitcairn Island(UK)Internet and Telecomm co-ordinating group. Access at <http://cbc.am/pitcairn.htm>

The right tools for the job.

When, in 1790, Fletcher Christian decamped to the Pitcairn Islands his band of mutineers was not discovered for another 18 years such is the isolation of this volcanic island in the southern Pacific Ocean.¹² At the end of the 18th century technology had not advanced enough for the British state to set off in 'hot pursuit'. Throughout history the lives of those who bore witness to the time have largely been shaped by the technologies that were available to them.

From flint in Neolithic times, passing through the Bronze Age (5600-3200BP) and the Iron Age (3200-2500BP) there are whole epochs that were defined by the summation of technology available to populations to carve out their culture. The Iron and Bronze Ages followed the agricultural revolution that applied basic biological selection to develop both domesticated animals and wild plants to act as the enablers for settled food production.

There is of course the idea that the progress of human technology is one of linear improvements, going ever forward. However history does show us that this is not always the case. The progress that was stretched out over Europe during the Roman Empire (2240-1500BP) is well summed up by The Monty Python comedy sketch from the film *The Life of Brian*:

“Apart from the sanitation, medicine, education, wine, public order, irrigation, roads, the fresh water supply and public health, what have the Romans ever done for us?”¹³

By the 9th century (1100BP) much of the technological progress set in motion by the Roman Empire across Europe had retreated into an older, rural, subsistence world. As writer Jeremy Rifkin observes of the 9th century AD: “the dumbing down of the European population reached a low-point...virtually all communications to the outside world were cut off.”¹⁴

From the 10th century onwards Europe embarked on a new path of technological progress which led to them usurping what were the more technologically advanced parts of the world in the 9th century – namely India and China.

Starting with watermills and followed by windmills European populations started to explore the power of energy to do work for them. They learnt how to appropriate the immediate manifestations of in-coming solar energy for gain. This was a major step forward. The oldest record of a windmill being constructed is in 1185 in the Yorkshire village of Weedley, overlooking the north shore of the Humber on what is now the edge of Hull.

¹² Fletcher Christian himself had died or been killed long before 1808 when Pitcairn was visited by the American trading ship Topaz and a report of the mutineers existence found its way back to Britain.

¹³ Currently this sketch from the film is available on YouTube. Access at <http://www.youtube.com/watch?v=ExWfh6sGyso>

¹⁴ Rifkin J (2009) 'The Empathic Civilization' Polity Press Cambridge p256

The late medieval historian Lynn White looked to the development of wind and water power as enabling Europe to make substantial technological progress that led to the first geographical assertions of power through the proto-globalisations of early empire building as by

“ ...the latter part of the fifteenth century, Europe was equipped not only with sources of power far more diversified than those known to any previous culture, but also with an arsenal of technical means for grasping, guiding and utilizing such energies which was immeasurably more varied and skillful than any people of the past possessed, or than was known to any contemporary society of the Old World or the New.”¹⁵

This is essentially the argument that Jared Diamond makes in his indispensable work ‘Guns, Germs and Steel’. Diamond, Professor of Geography at UCLA, argues that a combination of technological progress, ecological advantage and aggressive expansionism set Europe on a path of global dominance, which reached its zenith at the end of the 19th century. He goes onto argue that:

“...technology develops cumulatively, rather than in isolated acts, and that it finds most of its uses after it has been invented, rather than being invented to meet a foreseen need.”¹⁶

It may be difficult to assert such hard and fast rules, sometimes ‘necessity really is the mother of invention’. Why else would we have ended up with nuclear weapons? Yet what is conclusive is that technology, the tools that we employ in shaping our culture and our lives, is a central part of who we are and where we are. The future is about the technologies that we will employ to assert humanity’s presence on earth over the next century. Technologies we haven’t even imagined yet.

¹⁵ White L. (1964) ‘Medieval Technology and Social Change’. London: Oxford University Press. P.128-29

¹⁶ Diamond J (1997) ‘Guns, Germs and Steel’. London: Chatto and Windus p245.

Schrodinger's Mcat.

Humanity has made a huge technological journey over the past two centuries particularly since electricity was moved on from a scientific curiosity to an essential tool of human existence as a result of cumulative innovations throughout the late 19th century. I find it an oddity that it was the Surrey town of Godalming that first harnessed electricity to supply a public good, street lighting, back in 1881 but with Brighton hot on Godalming's heels with the Hammond Electricity Supply Company, the world's first commercial electricity supply organization, lighting up the seafront and shop windows. This is a mere 133 years ago.

By the mid 20th century science had started to get weird as physics, chemistry and biology collided with ever increasing complexity. Erwin Schrodinger, in 1944, posited the question 'What is Life?'¹⁷ This was not a philosophical enquiry but one based upon the interaction of biological existence with the physical laws of the universe.

Most famously Schrodinger, who embraced embryonic quantum theory, set out the famous 'Schrodinger's cat' thought experiment in which he tried to illustrate the interplay with quantum theory (which I am as thick as a *Planck* in understanding and will not even begin to pretend I understand) and biological, tangible reality. Is the cat alive or dead, who knows, *err* who cares? Actually it does matter because it was this scientific 'blue-sky thinking' from Schrodinger addressing the idea that biological life was based upon embedded codes (codescript) that inspired Francis Crick, who along with his partner James Watson set us off on the biological technological revolution with their identification of DNA, the very stuff of life. This has been a monumental technological leap forward.

At the turn of the century the United Nations observed:

"The new millennium finds us in the midst of a biological revolution driven by the explosive advances of genetics and molecular biology of the last half-century. This revolution has given the power to mankind to alter the course of evolution and to mold the stuff of life."¹⁸

¹⁷ Schrodinger E (1944) 'What is Life'. Access an on-line copy if you think that you can cope with a book that Schrodinger himself described as 'difficult'. http://whatislife.stanford.edu/LoCo_files/What-is-Life.pdf

¹⁸ Allende J E (1999) 'The Biological revolution and implications for health: an overview.' paper presented at UNESCO World Conference on Science. Budapest, Hungary. July-August 1999. Access at http://www.unesco.org/science/wcs/abstracts/l_9_biological.htm

At last mankind doesn't just have to worship God it can play at being God. It is the biological revolution that possibly provides humanity with the greatest range of ethical and moral dilemmas in the current age. Ever the practical ones Lloyd's of London, the global clearing house for insurance and re-insurance, have identified Synthetic Biology as an emerging risk and thus something to make money from. Acknowledging the drivers of Synthetic Biology Lloyds point to the argued benefits of such technology:

“Many believe that Synthetic Biology will be one of the transformative technologies necessary to combat climate change, energy shortages, food security issues and water deficits. By rewriting the genetic code it may be possible to make plants disease resistant, and salt, heat and drought tolerant.”¹⁹

The report goes on to note that there are no agreed global regulations on Synthetic Biology and that the ease of access to the science both in terms of cost and education is coming down all the time opening up Synthetic Biology both to exploitation by those who might use it as a weapon or a threat, or perhaps more likely, those whose experimentation is neither regulated nor safe.

In early 2012 the BBC reported on the activities of MadLab a Manchester based collective of 'street scientists'. They were cutting and splicing DNA with the same enthusiasm that a white wine-fueled book club discusses the latest zeitgeist novel. Their aspiration a gene synthesizer (about £1,000 off Ebay) – that would enable them to not only copy DNA but to make it to order.²⁰ Now I am sure MadLab are responsible folk who just want to tease out the inner geek in themselves and the young children that their Manchester-based programme of hands-on science caters for. Yet if they can do it...

Now, although it is easy to imagine a long list of benign and even hugely beneficial outcomes to such innovative endeavor it doesn't take a great deal of imagination to think of some malign impacts as well. A report by Friends of the Earth in 2012 clearly sets out the range of concerns about what the environmental pressure group call 'extreme genetic engineering' and the problems of 'biological error'. They also note that the influence of Synthetic Biology is such that it is estimated such activity will be to the tune of \$10.8 billion globally by 2016. They urge the precautionary principle and greater regulation.²¹

¹⁹ Lloyds Emerging Risks Team (2009) 'Synthetic Biology: influencing development.' July 2009.

Access at http://www.lloyds.com/~media/Lloyds/Reports/Emerging%20Risk%20Reports/SyntheticBiology_InfluenceTheDebate_July2009_V1.pdf

²⁰ Shukman D (2012) 'Early days in a DIY biological revolution' BBC News 28.03.2012. Access at <http://www.bbc.co.uk/news/science-environment-17511710>

²¹ Friends of the Earth USA. (2012) 'The Principles for the Oversight of Synthetic Biology'. Access at http://libcloud.s3.amazonaws.com/93/ae/9/2287/2/Principles_for_the_oversight_of_synthetic_biology.pdf

A less precautionary area of the splicing and dicing in science is Synthetic Chemistry and its adjunct 'designer drugs' or so called legal highs. Such Synthetic Chemistry builds upon the technological innovations right across all science disciplines. Schrodinger would have been fascinated by it, especially as the 'guru' of this clandestine movement, Alexander Shulgin, is quoted as saying that after ingesting certain psychoactive substances:

"I understood that our entire universe is contained in the mind and the spirit. We may choose not to find access to it, we may even deny its existence, but it is indeed there inside us, and there are chemicals that can catalyze its availability."²²

This is not wholly dissimilar, I suspect, to the time and space derivatives that are part of Schrodinger's musing on quantum mechanics. How do we grasp the interface between quantum states such as the idea of the *multiverse* and biological realities? Perhaps not by pondering about the cat in the box as Schrodinger would have it but the Mcat from the synthetic chemists cookbook of psychoactive 'highs'.

Mcat is the street name of Mephedrone a synthetic drug (4-methylmethcathinone) that hit the streets of Europe from 2003. By 2010 it was the UK's 4th most popular illicit drug

and was promptly banned. The precautionary principle is underlined by the 62 deaths attributed to 'designer dugs in 2012.²³ Synthetic chemists, particularly in China, have been tweaking its 'cook' ever since Mcat was made illegal across Europe in 2010, trying to keep one step ahead of the regulators and forces of law and order. It all reminds me a little of the 'innovations' that specialists in tax evasion are always dreaming up to sidestep regulation. One step ahead of the rules and regulations.

So Schrodinger's Mcat, is it out of the box? Natural or synthetic; real or unreal? Such is the fluidity and pace of the biological, chemical and physical science revolutions that are driving the technologies that shape our lives. Projecting further into the century I wonder if we will ever be able to digitalise human consciousness and thus reduce our very existence to not only the codescript of DNA but also to digital code as we capture the electrical impulses that drive our brains? If so, be careful in the future that your great grandchildren do not accidentally delete you from the family hard-drive.

²² The Wikipedia page on Alexander Shulgin contains this quote attributed to an interview with The New York Times. Shulgin died in 2014.

²³ Travis A (2014) 'Legal high drug deaths soar in UK.' The Guardian 12.02.2014 Access at <http://www.theguardian.com/society/2014/feb/12/legal-high-drug-deaths-soar-uk>

Digital divides.

When I was a student in the early 1980s and again in the 1990s I spent a huge amount of time in a variety of libraries often flipping through endless ‘micro-fiche’ slides or piles of old newspapers searching down a nugget of information that would sway my tutors into thinking that I had applied myself with sufficient academic rigor. I enjoyed it although I spent a lot of time getting sidetracked.

Today I can hunt down the most obscure information with relative ease from my cupboard like office at home. What do you want to know? How about in 2011 the Central African Republic sold the United States of America machinery worth \$245,000. No idea what the machines were so there are limits to accessing knowledge.²⁴ Or how about water recycling in Bora Bora? No problem. Check out ‘*Milestones in Water Reuse: The Best Success Stories.*’ By Lazarova et al.²⁵ The wonders of the internet, how did we get by without it?

However those that can access the exponentially growing store of on-line information have a key advantage in negotiating their route through life. The International Telecommunications

Union (ITU) based in Geneva, Switzerland, is the global clearinghouse for data on telecommunication technology. The most recent report by the ITU in December 2013 sets out the rapidity of take-up of mobile broadband connectivity. Broadband connected mobile phones are now actively subscribed to by 29.5% of the adult global population. In the developed world this figure rises to 74.8% whilst in the developing world it is 19.8%.²⁶

Access to a computer at home currently stands at 40.7% of the world’s population with 41.3% connected to the internet (some households clearly access the internet solely through their phone.) There are significant variations between countries with high and low levels of overall economic development. Although the cost of mobile communications and the internet is falling the cost is still a barrier to a couple of billion of the world’s citizens although the relative fall in costs is greatest in Africa.²⁷

Figure 8.1 shows the global scope of internet connectivity. It is clear that connectivity is closely correlated with economic development.

²⁴ Office of the United States Trade Representative. Access at <http://www.ustr.gov/countries-regions/africa/central-africa/central-african-republic>

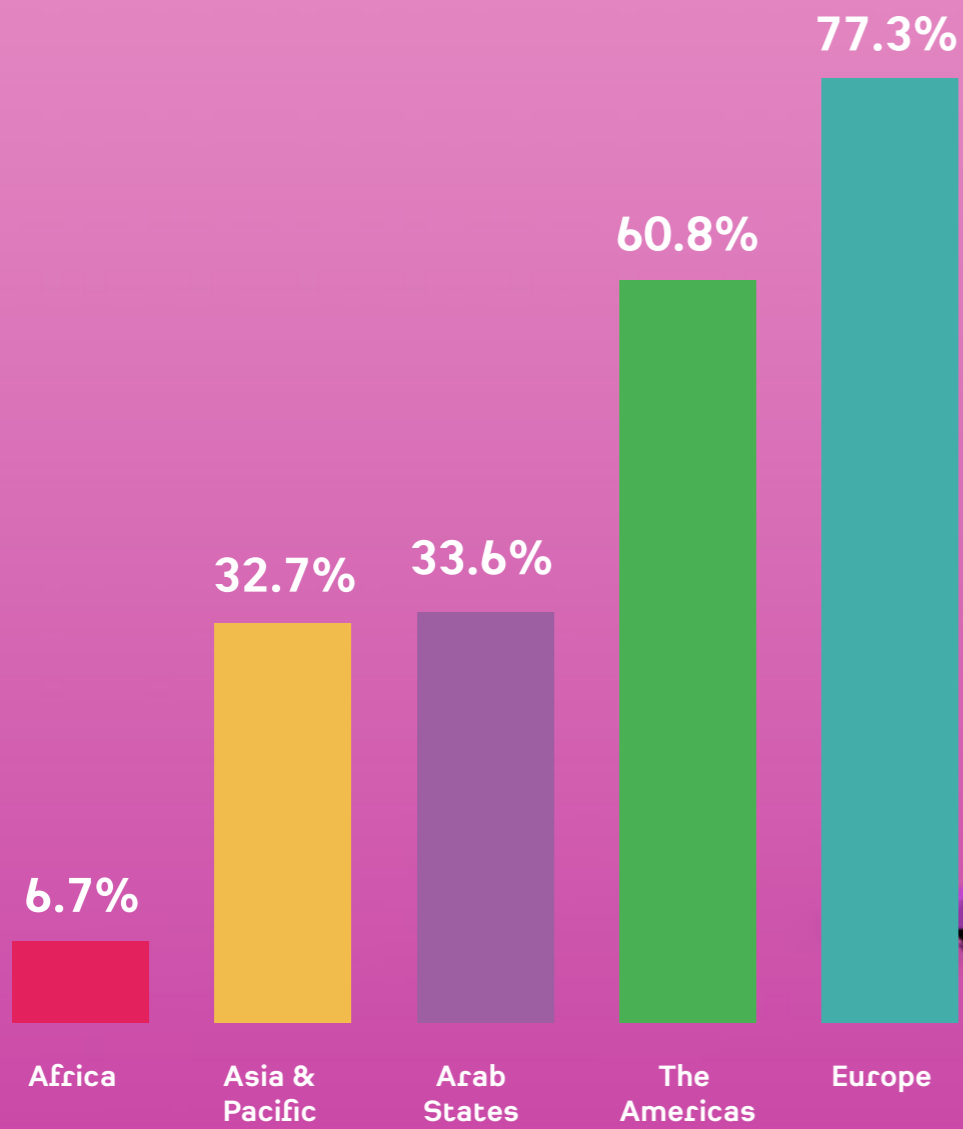
²⁵ Lazarova V et al (2013) ‘Milestones in Water Reuse: The Best Success Stories.’ IWA London. Access at

²⁶ All the data is from World Telecommunications ICT Indicators Database. Access at <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

²⁷ ITU (2011) ‘ICT services getting more affordable worldwide’ Press release 16.05.2011. Access at http://www.itu.int/net/pressoffice/press_releases/2011/15.aspx#.UwD4MBY25z8

Figure 8.1

HOUSEHOLDS WITH INTERNET ACCESS, 2013



So with 2.7 billion people in the world with access to the internet we clearly have entered a new age of global information. How will it change us?

Well first those that are outside of the Pandora's Box of digital delights are effectively second class global citizens. They are held back, are less able to fulfill their potential and have far more limited information upon which to base their judgments. Of course many of these billions may not even be literate, or have access to electricity so they suffer multiple deprivation. Yet some evidence suggests that such barriers are not as great as we might imagine.

In 1999 Sugata Mitra, a Delhi based computer entrepreneur, placed an internet connected computer in a hole in the wall of a Delhi slum. The computer wasn't stolen or vandalized but within days illiterate slum children had taught themselves the rudiments of how to use the computer, downloading an MP3 player to listen to Hindi music, using paint and draw facilities and browsing the net. All of this without any intervention or instruction.²⁸

In Thomas Friedman's 2004 documentary for the Discovery Channel 'The Other Side of Outsourcing' he visits a rural school in India for previously illiterate rural children many of whom live in homes without piped water or sanitation. These

children demonstrate amazing IT skills and when asked about their aspirations astronaut, doctor, scientist and writer are assertively expressed. No lack of ability, no lack of aspiration but for many still a lack of opportunity.²⁹

It must be remembered that the infrastructure to get people connected cannot simply be left to the market. What profit seeker is going to lay fibre-optics into Delhi slums - they are barely incentivized to role it out into the British countryside without substantial government subsidies. The £1.2 billion contributed by central and local governments in the UK to put broadband into rural Britain is a significant market distortion and with only one company picking up the contracts – British Telecom (BT) – a monopoly is being financed by a government that argued that state funded monopolies need to be broken up and privatised so that competition would drive down costs.³⁰

The challenge of moving towards a global, national and even local level playing field in the access to high quality internet connectivity is immense. Yet the necessity of such efforts is without question. The internet is potentially one of the most transformative technologies that has ever impacted upon the world. And although governments in the West have shied away from exerting market control they have been quick to realise that the old adage 'knowledge is power' still remains.

²⁸ Cohen D (2000) 'Slums surfing.com' The Guardian 17.10.2000 Access at <http://www.theguardian.com/education/2000/oct/17/itforschools.schools5>

²⁹ Friedman T (2004) 'The Other Side of Outsourcing.' Discovery Channel

³⁰ Wakefield J (2013) 'Rural broadband rollout: Taxpayers being 'ripped off' say MPs' The Guardian 26.09.2013.

The level of surveillance of internet traffic by Government Communications Headquarters (GCHQ) based in Cheltenham, Gloucestershire, is truly industrial in scale. Nearly all fibre-optic cables within and connecting the UK are 'tapped' with the permission of the private sector internet providers.³¹

In China, where the internet sits behind a 'great firewall' that, in theory, separates the internal Chinese internet from the rest of the world the level of government control is more overt than GCHQ. In 2009 over 5,000 citizens were arrested for accessing internet pornography, Facebook, Google, Twitter and YouTube are banned and this regulatory framework is policed by up to 2 million government employees.³²

The rolling out of the internet globally has been achieved with such rapidity that the ability of societies to understand the changes that it brings to all aspects of life has been fragmented at best. Where this is all heading, as access to information on a macro-scale becomes a global norm, is hard to predict. Not only does it convey great, almost unprecedented, levels of individual freedom it also allows for the unparalleled harvesting of information about people from those who have the power to do this, governments, commercial organisations who can buy data and the network providers with their invaluable 'analytics'. Perhaps the greatest digital divide of the 21st century will not be between those who can have access to this technology but between those who use it and those who watch over those who use it.

³¹ MacAskill E (2013) 'How does GCHQ's internet surveillance work?' The Guardian 21.06.2013. Access at <http://www.theguardian.com/uk/2013/jun/21/how-does-gchq-internet-surveillance-work>

³² Moore M (2010) 'China arrests 5,000 for internet pornography offences' The Daily Telegraph 01.01.2010. Access at <http://www.telegraph.co.uk/news/worldnews/asia/china/6921568/China-arrests-5000-for-internet-pornography-offences.html>

Where is the power coming from?

A mere earthquake shake from Silicon Valley, California, is Stanford University. It is one of America's premier universities and one of its richest. Professor Franklyn Orr is one of the star turns of Stanford and has recently been drawn into the US government administration as President Barack Obama's Under-Secretary of State for Science. He is one of the world's pre-eminent experts on energy.

As befits a private university with a \$16 billion endowment fund Professor Orr has hooked up with ExxonMobil, Toyota, Bank of America and other big private sector players to invest a quarter of a billion dollars into researching "new solutions to one of the grand challenges of this century: supplying energy to meet the changing needs of a growing world population in a way that protects the environment."³³ To this end they have produced an information graphic entitled 'Global Exergy Flux, Reservoirs and Destruction' that sets out the parameters that such endeavors work within. This graphic is concerned with available exergy – the useful proportion of energy that allows us to do work and perform energy services – and exergy has entropy – that is to say once utilised the usable energy is destroyed. The graphic rewards a long study is available as a

downloadable poster at http://gcep.stanford.edu/pdfs/GCEP_Exergy_Poster_web.pdf. It has not been included in this book because we couldn't work out how to simplify it and then re-draw it which was necessary as Stanford University were not forthcoming in granting us permission to replicate it. If anybody has a bright idea of how to do this may I suggest you contact me and Abby, Human Studio's, highly talented graphic artist, and we will have a go at a new representation.

The diagram – and it would be helpful if you are reading this on-line that you have a copy of the diagram up on screen – demonstrates that we have about 162,000 terawatts of incoming solar radiation to play with – of course over a fifth is simply radiated back into space.³⁴ Currently we capture and put to work about 18 terawatts of energy, the equivalent of just over 1/4800th of surface incident solar radiation.³⁵ So the name of the game is thinking how we can convert more of that incoming solar energy into productive work (electricity, motion, heat etc) without excessive carbonisation of the atmosphere. This is what the team that Professor Orr leads is engaged on.

There are so many possibilities. We have hardly scratched the surface of tidal power; humans globally are putting a mere 0.014% of the available tidal energy to work. Or geo-thermal

³³ Stanford University Global Climate and Energy Project website. Access at <https://gcep.stanford.edu/about/index.html>

³⁴ A terawatt is one trillion watts. One terawatt could power 10 billion 100watt light bulbs at the same time.

³⁵ This figure is derived from a lecture by Wes Hermann in 2006. The Powerpoint slides for this lecture are available on-line at <https://gcep.stanford.edu/pdfs/DyUMPHW1jsSmjoZfm2XEgq/1.3-Hermann.pdf>

energy with only 0.09% of the potential realised and wind power at 0.006% of global potential being brought to heel for human benefit.³⁶

Of course it would be extremely foolish to imagine that anything approaching more than a few % of global potential could be captured by these renewable power sources but if we harnessed 0.1% of the solar radiation that reaches the surface of the planet as heat and light that would be over 2 times the current global use of energy – all energy. Even 0.1% of global tidal energy potential (disproportionately distributed around the macro-tidal environment of the UK) would give us 2.5% of current global energy needs. As for wind power a 0.1% level of capture could provide just over 6% of current global energy demand. These figures are of course indicative and whether they could be achieved given our present technological knowledge is very much open to debate.

Clearly a mix of renewable energy sources could be sufficient to meet all human demand for energy. However what is required is the technology to make this happen at a cost that incentivises the adoption of such an approach. This is the holy grail of future energy that Professor Orr and his team are working on.

As befits a multi-disciplinary approach to such problem solving the use of nano-technology and DNA to produce super-efficient graphene based transistors are some of the collisions between chemistry, biology and physics that are being applied by the scientists at Stanford University to derive solutions to what is a fundamental human and planetary dilemma.³⁷

Why graphene – the ultra-thin carbon material developed at Manchester University – is so useful is that it is far more stable in a high temperature environment than traditional silicon and if you see the size of the computer servers that act as the hubs for the store and transmission of data you will understand the imperative. They get very hot and require constant cooling down. These data processing centres are now a significant cog in the modern global economy and that much computing power requires a lot of electrical power to operate. Keeping our power supplies functioning is fundamental to keeping our digital world on track. Not just in the domestic or work based environments but for the complex technical architecture that makes everything connect to everything else.

³⁶ All of these figures for energy potential are drawn from applying basic maths to the data contained within Figure 8.2. Of course this may be overly simplistic but the fundamental principle holds up as Professor Orr himself asserts.

³⁷ Abate T (2013) 'Scientist uses DNA to assemble a transistor from graphene.' Stanford University Global Climate and Energy Project press release. Access at https://gcep.stanford.edu/news/dna_transistor.html

Up in the clouds.

The US state of Oregon has the same population density as Afghanistan, 39 people per square mile, although Afghanistan is 250% larger in land area. Both have deserts, snow-capped mountain, seismic activity and a sense that in the world they are 'frontier locations'. Similarities then start to decline. Oregon is at the geographical heart of the global industry of data storage, processing and retrieval, Afghanistan is one of the least connected countries in the world with only around 5% of the population having access to the internet.

If you know where to look on Google maps you can hunt down the expanding cluster of large data storage and processing centres across Oregon. If you think the cloud is an ethereal place where your data exists in a never world of binary code somewhere like, say a cloud, think again: there is a chance it is in a massive anonymous industrial shed in the sage bush deserts of central Oregon.

A whole new geography of data centres with distinct clusters is being developed since the turn of the 21st century. The Google cloud is an actual place, The Dalles in Oregon State, USA. It sits adjacent to the mighty Columbia River but presciently and significantly above flood levels. West of The Dalles is Boardman, home of Amazon's cloud services and major terabyte space leaser Rackspace, the fastest growing 'cloud' provider in the world according to their publicity. To the south is Facebook's data centre at Prineville, a small town set up on the sage bush desert of central Oregon.³⁸ Their neighbour in this small desert town is Apple's iCloud facility. There are many smaller providers as well. Why here?

Obviously power is a major consideration and some providers like Google are big on harnessing green energy technologies such as solar and wind power.³⁹ Oregon has a major green energy sector. With 48% of the states electricity coming from renewable sources most notably hydro-electricity.⁴⁰ However as revealed by John Sheputis, chief executive of Fortune Data Centers, who have a major site near Portland in Oregon, the key reason is not the availability of energy – green or otherwise – but a low tax regime: "even if power were free in California he reckons he would be better off in Oregon."⁴¹ There is no sales tax in Oregon and few property taxes apply to these new businesses. The state raises nearly all of its revenues from

³⁸ The Economist (2012) 'Not a cloud in sight: The best places to store your terabytes.' The Economist 27.10.2012. Special Report: Technology and geography.

³⁹ Google website. Access at <http://www.google.co.uk/about/datacenters/renewable/index.html>

⁴⁰ Oregon Department of Energy website (2014) 'Where does Oregon's electricity come from?' Access at http://www.oregon.gov/energy/pages/oregons_electric_power_mix.aspx

⁴¹ Op cit The Economist

income tax thus it is a great place for global businesses to do business. As the local newspaper *The Oregonian* points out:

“Tax breaks and the Northwest’s relatively inexpensive power make Oregon an attractive location to data centers, which are proliferating across the state.”⁴²

The climate also helps with dry warm summers and dry cold winters. Proximity to the Pacific coastline with its submarine cables stretching across to Asia is also a locational advantage with the idea of latency (delay in moving data across distances) relevant.

There is no doubt that exponential growth of data, with 2.5 quintillion bytes being created everyday, will drive demand for more and more such stores of data. However clustering has its limits as it can make the global digital network vulnerable. Big players want to spread their risk and minimize the degree of latency. They will have clusters of data centres at a global level.

In Europe the data centres follow a similar power availability and low taxation model. Google works out of Ireland and Belgium. Amazon has nodes in Ireland, Holland and London although of course all transactions are done from low-tax Luxembourg.

In the UK the largest data centre is in Newport in South Wales. Its power source is a sub station providing the same demand as a city of 400,000 people to run its 19,000 racked servers. British Telecom is the main user of this facility.⁴³

This vast global network of digital storage is less than twenty years old. It will continue to expand into the foreseeable future especially as internet access expands globally and more and more of the core functions of society and the economy are moved on-line. Yet not only does this exponential growth in digital dependence afford us great benefits it also poses us significant risks. All of it requires vast amounts of energy, all of it is not invulnerable to attack both from natural forces but also malign human intent.

⁴² Rogoway M (2011) ‘Amazon confirms its data center near Boardman has begun operations.’ *The Oregonian* 09.11.2011. Access at http://www.oregonlive.com/silicon-forest/index.ssf/2011/11/amazon_confirms_its_data_cente.html

⁴³ Niccolai J (2010) ‘wales gets one of the world’s largest data centres’. *PCadvisor* 16.03.2010. Access at <http://www.pcadvisor.co.uk/news/small-business/3217407/wales-gets-one-of-the-worlds-largest-data-centres/>

New ways to kill people.

The Stuart Highway starts in Port Augusta, South Australia, and travels northwards across varying degrees of barren desert before arriving 2834 kilometres later in steamy tropical Darwin on Australia's north coast. On your first day out of Port Augusta, after a few hours drive, the first place you will arrive at is Spuds Roadhouse in Pimba. Fill the tank up and tuck in because there is nowhere to stop north of here until Glendambo another 111km on. You will be passing through the top secret Woomera Prohibited Area. This is where the British Ministry of Defence have been testing the UK's most hush hush military project, Taranis, an armed drone that can fly at supersonic speeds and be un-detected by radar. This might be the future of war.

Human beings are an inventive lot. Yet somewhat depressingly we have expanded an inordinate amount of energy in dreaming up new ways to kill each other. Taranis gives us the ability to kill people without even having to be there. We could be sitting in an office in chilly Lincolnshire⁴⁴ and via a satellite link be flying over the inhospitable mountains of Waziristan hunting down 'the bad guys'. It is an example of life imitating computer games.

Taranis is an all-British affair with up to 250 technology companies contributing to its multi-million pound development. A proud managing director of lead contractor BAE Systems stated:

"It truly represents an evolution of everything that has come before it. This milestone confirms the UK's leading position as a centre for engineering excellence and innovation."⁴⁵

Such a technological approach to warfare isn't new to Britain's armed forces. In the past six years Britain has fired 300 missiles from drones in operations in Afghanistan.⁴⁶ However technology has also provided new tools for low-level insurgents in asymmetrical warfare. Often the drones are hunting down the Taliban operatives who utilize mobile phone technology to detonate improvised explosive devices (IEDs) hidden on dusty tracks frequented by anybody they don't agree with and sometimes innocent civilians who happen to be passing by at the same time.

At the end of World War Two the UK had 3,818,292 members of its armed forces by 2020 this number is estimated to be about 82,000.⁴⁷ With a shrinking number of boots on the

⁴⁴ Since 2013 the UK operates its military drones from RAF Waddington in Lincolnshire. See Goldfarb M (2012) 'UK brings drone command operations home from US.' Global Post 26.10.2012. Access at <http://www.globalpost.com/dispatch/news/regions/europe/united-kingdom/121025/uk-brings-drone-command-operations-home>

⁴⁵ Grimson M and Corcoran M (2014) 'Taranis drone: Britain's \$336m supersonic unmanned aircraft launched over Woomera.' ABC News. 07.02.2014. Access at <http://www.abc.net.au/news/2014-02-06/taranis-drone-uk-mod-bae-systems-woomera-south-australia/5242636>

⁴⁶ Op Cit Global Post

⁴⁷ Summers C (2011) 'The time when the British army was really stretched.' BBC News 23.07.2011. Access at <http://www.bbc.co.uk/news/magazine-14218909>

ground the British military has moved increasingly towards technology to maintain its bite.

The biggest ticket item on the UK's current military shopping list is the construction of two aircraft carriers that will come into service sometime after 2020, HMS Queen Elizabeth 2 and HMS Prince of Wales. The cost of this project is a little fluid but the carriers themselves are coming in at around £6.3 billion and then there are the planes, US built F-35 Joint Strike aircraft.

In the endless pursuit of greater technological advancement the Lockheed Martin built F35 is the most complex plane ever built. It has 8 million lines of computer code, 400% more than any comparable fighter aircraft. At present they can't work out quite how to make it all work and there is serious doubt that, at least initially, the F35s will be able to use British made weapon systems because of the coding problems, although that hasn't stopped the UK ordering 48 of the vertical takeoff version to populate its new carrier fleet.⁴⁸ This will cost somewhere in the region of £4 billion and every little helps as the US government will spend \$1.5 trillion developing and purchasing this, the world's most expensive weapons system.

All that code could prove trickier than we ever thought as in the lexicon of modern warfare 'full spectrum dominance' – the mantra of the US military machine – includes the land, air, sea and also cyberspace. Whether or not we can call any act to date

involving aggressive use of code technology an 'act of war' is a moot point.

In 2007 the Baltic state of Estonia received a temporarily debilitating denial of service attack that originated in Russia. Nobody died, no land was occupied and Estonia rebooted its systems with a lesson in computer security learnt.⁴⁹ However the future is another thing and digital complexity brings with it a host of 'unknown unknowns'. The jamming of electronic surveillance and digital operating systems could provide appropriate military leverage in conflict. You know for sure that white-coated boffins are pursuing these directions as we speak. However the manipulation of electrical systems, traffic control, mass communication and social media all shake out a myriad of disruptive possibilities.

It is hard to judge how resilient any individual, business or nation is to cyber aggression. The UK Serious Organized Crime Agency (SOCA) estimated that in 2010 on-line fraud cost the UK economy £3.5 billion. Yet more existential threats from technology in the future will probably cover more than just those mediated by code alone. Biotechnology, nanotechnology and low-tech suitcase sized radiation bombs are three that spring to mind as possibly providing more than a good source of material for science fiction writers. All three could (and of course might not) unleash highly destructive scenarios that could bring nations to their knees for whatever desired reason.

⁴⁸ McGarry B (2013) 'Experts to study F-35 software delays.' Defensetech 26.12.2013. Access at <http://defensetech.org/2013/12/26/experts-to-study-f-35-software-delays/>

⁴⁹ Nato Review magazine on-line carries a range of material on cyber conflict including a timeline of events and video interviews with the President of Estonia and leading experts in this area. Access at <http://www.nato.int/docu/review/2013/Cyber/timeline/EN/index.htm>

Sometimes in a world of multiplying complexity simply depriving people of the technological infrastructures that underpin their lives would be sufficient to instigate panic and uncertainty. Never underestimate the ability of humans to cook up ever more fiendish ways to terminate your existence. Humans can be a malign bunch at times. You might have to go and hide somewhere remote. Somewhere like Woomera.

Imagining your future.

When conversations steer towards the ways technology could provide us with ways of inflicting destruction and misery upon our world everything sounds pretty scary.

When I was in my late teenage years the future also looked scary. The Cold War was approaching its height and my school decided to show us the nuclear war film satire *'Dr Strangelove or: How I Stopped Worrying and Learned to Love The Bomb'*. I laughed but was more than a little worried as well. Nuclear destruction seemed so real in the 1970s.

When I left Sheffield Polytechnic in 1985 I spent a cold winter searching for work without any joy. I lived hand to mouth with barely a pound to my name. The future looked bleak. I survived and for this give thanks to cheap afternoon shows at Sheffield's alternative cinema, *The Anvil*. It was warm watching a film and

the cinema's staff, led by the far-sighted Dave Godin, never chased us out.⁵⁰

Nothing I have experienced comes close to the uncertainties that so many in the world shoulder. A walk around a Syrian refugee camp in Turkey, a talk with fearful Muslims fleeing Christian mobs in the Central African Republic or to bear witness to the pitifully scratched existence of the tens of thousands of street kids whose home is the pavement in India's teeming cities. All would give you a fuller sense of perspective. Yet that doesn't necessarily help you in the here and now, thinking about *your* future.

It is not that I make the claim that the future is so bright that you might have to wear shades but that being concerned about the future, your future, is natural, normal, healthy even. In fact it is concern about the future that is one of the key drivers of modern geography. It is a subject uniquely placed to investigate all the aspects of how we live on our planet within the environment that has been endowed to us.

The rapidity of technological change brings new challenges. A sense of anomie towards this technological change can prevail.⁵¹ This can be amplified into a fear of technology in extreme cases. Yet technology is one of the key levers that will enable us to move forward even if so much of it today is imbued with a complexity that few can fully grasp.

⁵⁰ David Godin is attributed with coining the phrase 'Northern Soul' and was manager of The Anvil Cinema, Sheffield between 1983 and 1990. Two great achievements in a lifetime, thanks Dave. The Anvil is now closed. Dave died in 2004.

⁵¹ Anomie is associated with the fragmentation or breakdown of an individual's connection with wider society. It is often linked to the breakdown of older more stable ethics and conventions in the face of change.

Yet we make choices about technology. Today we employ technology to gather information about you, to track you, to watch over you. Every time you hand over a store card, buy something on-line, exhibit a consumer preference that can be recorded, you are immersed in a huge information engine. You are being measured, monitored, nudged and coerced. It is little wonder that so many yearn for simpler times even if such systems have the potential to provide us with tangible benefits from better health interventions to the faster solving of crimes via DNA databases.

Many of the fundamental strengths of geography are also its weaknesses. It is a big subject with an almost unlimited number of avenues to travel. Much of what it shines a light on is connected to so much else. It is complex and comes with few, if any, definitive answers. One of the key aspects to grasp is how technology has provided us with the tools to manipulate and exploit our planet's resources. Yet just as important to consider is how we can utilise technology to arrive at more sustainable solutions: your future depends upon it.

How? What? When? Why? Where?

Want to know a secret? Ask lots of questions.

You have to give a bit of a damn to really get under the skin of geography and that will be partly shaped by your personal philosophy. Do you want to understand how being born in Britain will help you live a longer life than somebody born in Malawi? Do you think about what the impact of climate change will have upon global biodiversity? Do you wonder when humanity will realize that it cannot live outside the fundamental laws of physics? Do you have the inkling to inquire why the very few, the 0.1%, own and control so much of the world's resources for their own enrichment? Do you have the inquisitiveness to ponder where all the stuff that sustains your life comes from?

Humanity has travelled so far because it is an endlessly restless species. Always questioning, always thinking. If you want to embrace your humanity embrace your inquisitiveness.

I am a little concerned when I ask students what the most common trees in the British Isles are and whether they could identify them from their leaves. Now, living in a city with probably more trees per head of population than any other city in the UK – Sheffield – you might think that they are less encumbered by a lack of rurality but no, rarely do I get

anything that resembles anything other than the most cursory of knowledge. Err, Oak, umm the conker tree. Every day you walk past these trees, they sustain your life, expelling oxygen and absorbing carbon dioxide, so why not take an interest? Be aware, be inquisitive, and ask lots of questions.

Money can't buy you love.

What would you do, what would you buy, if you were suddenly encumbered with great wealth? Cars? Homes? Jewelry? A yacht? Well that is all a bit passé today according to those sharp-eyed watchers of the wealthy the Boston Consulting Group (BCG). Today it all about 'being' rather than 'having.' A senior partner of BCG is quoted as saying: "consumers are moving from owning a luxury product to experiencing a luxury."⁵²

Apparently in 2013 the super wealthy spent \$460billion on 'one-of-a-kind travel experiences'. Swimming with dolphins off the Galapagos Islands, shooting big game in the African savannahs, hanging out with Emperor Penguins in Antarctica, luxury yurts at Glastonbury music festival or being carried, literally, to the top of Mount Everest by the world's finest mountaineers. Oh we could go on but all the above suggestions are examples I have read about in the past six months.

I'm sure you can imagine a few experiences that you wouldn't mind buying. I wonder how much it will cost me to get Bobby Womack to play at my local pub?⁵³

In 2011 Chris and Colin Weir of Ayrshire Scotland were transported to this land of unimaginable riches. They won £161 million on the Euromillions lottery; this was the biggest win ever in Europe. They commented to the press:

"We're not scared of it. Its going to be fantastic and its going to be so much fun."⁵⁴

So far so happy if the press clippings are to be believed. The Weirs have set up a charity to help Scottish community groups, they have given some support to the Scottish National Party, they have paid off the debts of their local football team Partick Thistle and of course they have bought a bigger house but only down the road from the smaller original house which they gave away to a close friend. I wish them well.

Do not fret. You are as likely to find yourself in the Weir's shoes as being killed by a random axe murderer whilst walking down the street. For the vast, vast, majority of us life is far more mundane, ordinary and average. UK median household income in 2012 was £427.27 a week.⁵⁵ It has been going down since 2008.

⁵² Wood Z (2014) 'Super rich shift their thrills from luxury goods to costly experiences' The Guardian 30.01.2014. Access at <http://www.theguardian.com/business/2014/jan/30/super-rich-shift-experiences-new-status-symbols>

⁵³ Unfortunately Bobby Womack died in June 2014 aged 70. This was a few months after I'd written this story. So how much would it cost? It would be priceless.

⁵⁴ Scott K (2011) 'EuroMillions jackpot win makes couple richer than Ringo'. The Guardian 15.07.2011. Access at <http://www.theguardian.com/uk/2011/jul/15/euromillions-jackpot-uk-winners>

⁵⁵ Data from the Institute of Fiscal Studies. Access at <http://www.ifs.org.uk/fiscalFacts/povertyStats>

I am a big fan of average or ordinary so I am intrigued what it is that folk like myself most regret about our lives. Is it our inability to capture vast wealth and to strut between the world's pleasure palaces via private aircraft and facilitating flunkies? No. It is far more likely to be that we spent too much time working and thus neglected our families.

Bronnie Ware an Australian palliative nurse who has counseled the dying in their last days for many years has drawn together the comments of her patients. The top five regrets expressed to her have been:

- I wish I'd had the courage to live a life true to myself, not the life others expected of me.
- I wish I hadn't worked so hard
- I wish I'd had the courage to express my feelings.
- I wish I had stayed in touch with my friends.
- I wish that I had let myself be happier.⁵⁶

No doubt these regrets are mediated to some extent by the cultures her patients came from but I suspect there may be a few germs of universal truth in this list somewhere. I am of an age where such thoughts occasionally flit across my mental radar when I am not knee-deep reading students work, attempting to write books or imagining what I would do if I won the Euro 'big one.'

Of course there is a long tradition of the super-rich being buried with their possessions in tombs that they hope will project their magnificence for all time, such is their fear that they will be forgotten. The pharaohs of Egypt had perfected this approach millions of years ago but British millionaire Nicholas van Hoogstraten, a man who has declared his personal disdain for democracy and subscribes to the idea of 'rule by the fittest', has built a grandiose mausoleum for himself on his country estate in East Sussex.

Van Hoogstraten is a man whose wealth is predominantly generated today from mining interests in Zimbabwe and the Democratic Republic of Congo. His business interests are directed through a series of offshore territories principally the Bahamas. He is currently 69 and will probably live as long as his good friend Zimbabwean despot Robert Mugabe and die, if not happy, then rather smug that he was 'fitter' and thus richer than you. We can but marvel at his mausoleum and think 'arrogant bastard'.

There is much wisdom in the Bible.⁵⁷ One of my favourite bon mots is in the gospel of Matthew.

“Again I tell you, it is easier for a camel to go through the eye of a needle than for a rich person to enter the kingdom of God.”⁵⁸

⁵⁶ Steiner S (2013) 'Top five regrets of the dying' The Guardian 01.02.2013 Access at <http://www.theguardian.com/lifeandstyle/2012/feb/01/top-five-regrets-of-the-dying>

⁵⁷ There is also much that is incomprehensible, ridiculous and rooted in fear, ignorance and down right stupidity. I am sure such a critique will be made by somebody about this book as well.

⁵⁸ Matthew 19:24

The 2nd Marquis of Rockingham at sometime in the early 18th century was clearly vexed by this aspect of the Bible. He was one of Britain's richest men. He lived in one of the grandest of all England's stately homes, Wentworth Woodhouse, Rotherham. To address this philosophical quandary, or to win a drunken bet – opinions vary – the minted Marquis constructed a stone needle on his estate through which he could drive a coach and horses, lacking as he did a camel. He wasn't going to let God get one over on him, after all had he not built a rather splendid church in honour of 'Him' in the estate village of Wentworth. He bought – or rather constructed – his passport to the love of god. It will not surprise you that the 2nd Marquis had a Roman style mausoleum 90 feet high built on his estate even though he was interned in the medieval splendor of York Minster. He was by some accounts 'much loved' by the populace of his estates.⁵⁹

So what would you do to live a good life if you had no economic constraints? Would it be full of visceral pleasure and self satisfaction built upon a portfolio of 'experiences' only restricted by the paucity of your imagination? Would it be about your family, your friends, the relationships with your fellow humans? Would you want to be loved, would your money buy you that?

Our common future (or take a deep breath and be brave.)

In 1987, after many years of debate, consultation and synthesis, Gro Harlem Brundtland, the Prime Minister of Norway, presented the report that carried her name to the rest of the world. Brundtland had been charged with the responsibility of investigating the deteriorating environmental conditions of the planet and the role of human development in facilitating such a decline by the United Nations. The report was called 'Our Common Future.'

Our Common Future brought to the foreground the idea of sustainability. This is defined by Brundtland as:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”⁶⁰

Since then the phrase 'sustainability' has been hi-jacked, distorted, misapplied and mis-represented in a myriad of ways. Businesses talk about 'sustainable business plans', shops talk about sustainable sales and politicians murmur about sustainable levels of support for ideas. No! Sustainability is about engaging in human behaviors that do not make the future more challenging and problematic for our children.

⁵⁹ Howse G (2002) 'The Fitzwilliam (Wentworth) Estates and The Wentworth Monuments'. Wentworth Trustees. Rotherham. P131-137

⁶⁰ World Commission on Environment and Development (1987). 'Our common future.' Oxford: Oxford University Press, p43

It is a planetary notion and it is a concept imbued with a respect of the needs of the world's most marginalized citizens to live better, more fulfilled lives and an appreciation of the technology and organisational parameters that frame the range of choices we can make in order to achieve the objective of sustainability.

I have barely met or heard a politician, of any persuasion, who really grasps sustainability (Green politicians excepted). They are wrapped up in a way of thinking little more than a few years ahead, the election cycle. Furthermore at the heart of political power is the affliction known as 'affluenza'; the ability to become swept up in the acquisitive pursuit of wealth for its own sake with consequent implications for our overall mental health.⁶¹ We constantly adjudge the success or failure of our economy – any economy – on its relative rate of economic growth, the acquisition of more stuff.

Yet I have also been struck by the observation that many of those who promote sustainable thinking and action do not apply a sustained critique of capitalism and particularly the globalisation of financial capital. Put simply we cannot begin to enact significant and meaningful change in the progression

towards sustainability unless we completely re-structure global financial capital. It is time for us to return to political economy rather than the unfettered market.

Whenever radicals, visionaries and progressives suggest alternatives to our current forms of social and economic organization they tend to be berated with scoffing comments such as 'they don't understand how the world really works' or 'what planet are they on?' The answer of course is that radical geography does understand how the world 'really works' - both the economic aspects but as importantly the environmental aspects. The reason geography is afforded this lofty position is that it uniquely joins up all the dots to begin to see the big picture.

Our lives are embedded in a social, economic and political system that shapes every aspect of them. Much of the time we give little thought to these over-arching structures, we are simply getting on with living: working, cooking, cleaning, playing, paying the bills. However, what we bear witness to in our everyday lives is a bit like the proverbial iceberg, we rarely see more than a small part of it. What keeps it all afloat is an unseen mass.

There can be little dissent from the assertion that the system that shapes us is under-pinned by a clear and distinct ideology, one that has grown and evolved over time, absorbed new

⁶¹ James O (2007) 'Affluenza' Random House. London. This is a provocative call to arms to address the virus of affluence that James argues has led to a reduction in our collective mental well-being.

technologies and embraced a sense of the world as a global entity rather than something simply local and specific. This is capitalism.

Sure other ideologies have come and gone. Some have even been resistant and stuck around such as socialism and Confucianism. Capitalism itself hasn't stood still and has fractured and re-invented itself until we find one 'brand', neo-liberalism, asserting its ideological dominance over more 'dilute' versions of capitalism.

One of the high priests of neo-liberal thought, Freidrich Hayek, stated that "economic control is not merely control of a sector of human life which can be separated from the rest; it is the control of the means for all our ends".⁶² What Hayek is arguing is that it is the economic realm that shapes all our relationships and that everything within the economic realm is a commodity that exists primarily within a market – including love, nature and social relationships.

Markets always exist, trade has been a backbone of human society ever since Neolithic man traded some mammoth skins for a particularly sharp piece of flint. However left alone markets will always distort, corrupt and become ecologically sub-optimal based as they are on the golden economic dilemma of unlimited desires and a limited set of resources to address such desires. All the choices you make are economic

choices: this or that. Yet they are also political choices: this or that.

Political choices are routed in our sense of greater human wellbeing, our families, our communities, our cultures that build upon wider philosophies, more often than not religious, of what it is to lead a good life. Power often comes into these discussions. What it is, how is it wielded and how can it be retained?

Some people take a view that humanity is in perpetual competition for resources and that one person's exercise of power over another person is the 'natural' way of things.⁶³ On occasion such thinkers draw upon evolutionary psychology to act as intellectual ballast for their assertions. They argue that because such competition was the natural state of things in the past when Neolithic man was dodging not just animals with big teeth but fellow humans with covetous aggression then such an imperative remains today. Some evolutionary psychologists go onto argue that the long-term evolution of man has a fundamental 'meme' or collective memory that has been passed on.⁶⁴ This then shapes human behavior, even today, as an approximation of that fundamental competitive urge: kill or be killed, the survival of the fittest. It is an extreme position but it is the backbone of the global financial system and neo-liberal capitalism. We may personally repudiate such thinking but it still shapes our lives through its ideological hegemony.

⁶² Hayek F (1944) 'The Road to Serfdom'. University of Chicago

⁶³ This is sometimes referred as Hobbesian after the English philosopher Thomas Hobbes (1588 -1679) who argued that without government the natural state of man was to be engaged in perpetual war

⁶⁴ A meme is a bit like a gene in that it is something that is passed on from generation to generation but in the case of a meme it is a package of cultural norms or learnt behaviours.

Often it is these same people who think that some humans are innately superior to others; this has been the backbone of racism, homophobia and elitism over generations. Some even argue that such advantage is something we are born with, it is part of our genetic code – eugenicists like Marie Stopes and Hitler supported such thinking. Don't worry if you fail your A levels, it isn't your fault you were just not born that bright.

It probably will not surprise you that this is an approach to thinking that I do not buy into. In a hyper-complex, increasingly global world where once disparate, disconnected, populations are in continuous new collisions, humanity's challenges for the 21st century are universal not individualistic.

We are not simply bound together as people but we are bound together with our natural environment and the limitations of physical, chemical and biological science that underpin it. We are not alone we *share* our planet with a teeming multitude of life.

The first step to re-connect with these fundamental realities is to take a deep breath and realise that capitalism has massive limitations for all the benefits that it has bestowed upon us. The market is not going to save us; politics is going to save us. Being informed, being active, being a good local and global citizen.

Governance and the political process are about rational decision making within the constraints of resource provision. Therefore you could argue that everything you do is political as politics is about the choices we make at every level. I'm always a little aghast when the phrase 'bringing politics into it' is used as a negative criticism. It is as meaningless as the assertion that something is being used as 'a political football'. All that means is that the debate about the choices is in dispute and the arguments are difficult and unresolved.

So take a deep breath and be brave, commit to taking politics seriously. The saturated technological environments within which we are now evolving have given us both the tools and the constraints to enact progressive change. We can know so much more if we know what questions to ask. So get sharp, get smart. Philosophy matters, politics matter, economics matter, physics matters, biology matters, chemistry matters, history matters, technology matters, humanity matters and geography knits them altogether with our planet and all its teeming life. Our common future depends upon it.

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