

SAMSUNG



**Samsung KX50:
The Future In Focus**

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How We'll Live In 50 Years

Introduction

50 years ago, when Samsung was established and began designing its first television set, who could have predicted that today you'd be streaming video onto your Samsung Galaxy Tab S6, that you'd carry your phone in your pocket and monitor your heartbeat on your wristwatch, or that an app could enable you to turn the oven on at home while you are still miles away on a train?

This year, as Samsung unveils its new showcase destination, Samsung KX, in Coal Drops Yard, London, we have invited six futurists and academics to look ahead to the next 50 years of digital evolution and predict how it will affect our cities, our travel, our working lives, our food, our leisure and our health.

The six experts are all eminent in their fields and their opinions respected and sought by governments and global companies. They are:

- **Jacqueline de Rojas**, CBE, President of techUK and Co-Chair of the Institute of Coding
- **Professor Dale Russell**, Professorial Mentor and Specialist Advisor to Innovation Design Engineering at the Royal College of Art
- **Dr Morgaine Gaye**, food futurologist and director of Bellwether Food Trends
- **Maneesh Juneja**, digital health futurist
- **Dr Rhys Morgan**, Director of Engineering and Education at the Royal Academy of Engineering
- **Matthew Griffin**, futurist and think tank founder

One of the first things that struck me, reading their submissions, was how much consensus there seems to be between all our futurologists, on matters such as direct brain-to-internet connection being a very real possibility before 2069, or on subsonic tube transport systems (STTS) that will revolutionise travel at speeds of over 750 miles per hour. Fifty years ago, it was still rare for most Britons to venture abroad for their holidays. The package holiday was only just becoming fashionable, and you were considered a bit of a pioneer if you sunned yourself on the Costa del Sol or among the Greek Islands. Some of our futurologists have suggested another possibility for 2069 – virtual

holidays, where you need not even leave your living room or even package holidays to Mars. It is interesting to note that the technology that could support many of these ideas is far from remote. 3D printers already exist, and before long they could become affordable for every household, performing a variety of functions. Drone deliveries are in our near, rather than far, future. Haptic feedback kits are already with us, and gamers are queuing up to try this new technology which allows them to feel, as well as see, in virtual reality.

Which brings me to another piece of futurology – and this one is Samsung's own prediction, about the future of retail. The new Samsung KX destination in Coal Drops Yard, King's Cross, is a place of discovery to experience the latest in culture and innovation, powered by Samsung technology. It showcases the complete Samsung Ecosystem, how multiple devices and services come together to deliver a complete and harmonised experience, making consumers' lives easier, more convenient, and more efficient. It will be the ultimate creative space within which Samsung will present its latest and greatest technology and become a centre of excellence for customer care. This, if you like, is Samsung's own prediction for the retail of the future – 'stores' as consumer touch points and experience centres. I personally predict that there will still be bricks and mortar 'shops' in 2069, but they will be about entertainment, fun, learning and support. Perhaps you might visit the Samsung KX of the future to be fitted for your new haptic body suit and neural net, or have a subcutaneous health sensor implanted.

So buckle your seatbelt, enjoy our futurists' predictions, and set a course for the heart of the sun – the future isn't as far away as you might think.



Tanya Weller,
Director of Samsung Showcase, KX



A Window into Our Future World:

Work and Leisure in 2069,
by Jacqueline de Rojas CBE

As one of the UK's most senior figures in tech, Jacqueline de Rojas CBE supports the industry through her presidency of techUK; she serves as a non-executive director on the boards of Rightmove plc, AO world plc and the Costain Group plc; She is the president of Digital Leaders, the Co-chair of the Institute of Coding and is a passionate advocate for the tech industry to embrace diversity and inclusion and for using technology to tackle the global challenges of our time. Her predictions include an end to the traditional daily commute as well all those repetitive, mundane tasks, which will in the future be tackled by robots and artificial intelligence, while business colleagues could turn up at meetings as holographs.

The next 20 or 30 years will bring the largest technological changes and innovations we have ever seen in our work and leisure. The Digital Revolution, just as the Industrial Revolution did 250 years ago, is challenging all our assumptions about how we shall lead our future lives. We shall be connected to EVERYTHING, and everything we do will be assisted by digital technology. Come with me and I will show you a glimpse of the future...

The good news is that most of these changes could help reduce our carbon footprint. The traditional commute to the office has all but disappeared. We are able to work wherever we are, at home or on the move; smart vehicles serve as both office and hotel room, offering the perfect environment for each individual, tailored to our individual needs. No need to place those fingertips on a keyboard: direct brain-to-internet connectivity, enabled by the speed of quantum computing, has become a reality. No need to keep your eyes on the road, either, because the vehicle does the driving for you.

Not that there will be much need to go anywhere. Networking is now truly global. We meet, talk, and build face-to-face relationships across geographies, regardless of where we are. Thanks to virtual reality, we have significantly reduced the carbon footprint of company meetings. You don't miss shaking hands physically with your colleagues, because holographic interfaces and biofeedback systems make it feel that you are physically connected and engaged, even when there are 5,000 miles and several time-zones between you. After the meeting, you can now play a game of virtual golf (or netball!) together or visit an online 'bar' to get drunk, sing karaoke and bond.

Language is no longer a barrier. Brain implants, like the translation device in Doctor Who's Tardis, or the Babel Fish in The Hitchhiker's Guide to the Galaxy, which swims through your ear into your brain to make any language instantly understandable, have totally changed how we interact with our colleagues across the globe. Learning languages has become unnecessary, unless simply for pleasure. Instead, cultural alignment, empathy and the ability to make a human connection to anyone, no matter what their background, are new and highly sought after skillsets.

Repetitive, mundane admin tasks have disappeared. AI (artificial intelligence) assistants are making data entry obsolete, predicting our next move as machine learning ramps up its capability. Algorithms are processing data and either prompt us to make decisions or are doing it for us.

In retail, there is no physical high street. Instead you are making purchases via your screen... not through the traditional shopping channels, but whilst watching your favourite entertainment shows. Happen to like the dress that actress is wearing? What about that sofa the presenters are sitting on? TV ad breaks are a thing of the past because everything you see on the screen is available to buy, from the swimsuits and bikinis worn by the contestants on the 2069 equivalent of Love Island to the Omega watch in the Bond movie. No cash, no swiping (wallets and payment cards have been superseded by wearable tech), just pure desire making the purchase for you – though it is hoped the TV will check in with you: 'I know what you're thinking....Are you sure you want to make this transaction?' Every on-screen image links to a shopping opportunity, and the screen monitors your emotions and reactions, harvesting your eyeball movements, watching what you don't do as much as what you do, creating a profile and dragging it into a "data lake", to tailor what you will see next time you watch.

When your purchase is dispatched, it no longer travels from the other side of the world. It may have been designed there, but a major revolution in the global supply chain will have eliminated the need for the movement of cargo and freight ports. The instructions for making it (in the perfect fit,

“ smart vehicles serve as both office and hotel room offering the perfect environment for each individual ”

since your body measurements will also be held in the data lake) will be received by a local 3D printer and it is now manufactured on the spot, then delivered to your house by drone.

Education has become our largest industry, equipping us with new skills to cope with the pace of technological change. The jobs of the future are not the same as the past – we must skill up and prepare ourselves for jobs that do not yet exist. As the author Yuval Noah Harare says: “It is not the rise of the robots that we should fear, but the ability to reskill ourselves every ten years or less...” – and maybe more often.

Do we still learn in schools and colleges, or at home? The lines between work and leisure have become blurred, entertainment morphing into ‘social enterTRAINment’, as one training expert put it. Entertainment has become yet more interactive. We are living our lives in front of a screen, and in an effort to “get the planet moving again” towards healthier lifestyles, we find ourselves increasingly physically involved with what we watch. For example, watching an adventure film, we are invited to move as if we were exerting ourselves in the same way as the characters – skiing our way out of danger, perhaps, or fencing with an opponent. The data generated from your movements is probably fed back to your insurance company to win you lower premiums on your health insurance.

Haptic feedback suits give us the ability to feel what we watch. Instead of passively watching a sport we become part of it, actively experiencing what it is like to be on the pitch with the players. (It’s hard enough now watching your kids on the rugby pitch, but imagine what it will be like when a haptic suit lets you feel every bump and tackle!)

The intersection of bioscience and tech has radically shifted virtual experiences online. Perhaps by 2069 we shall no longer feel the urge to go away on holiday, because we can experience another place without leaving our living room, the feeling of sand, the sound and smell of the ocean and warmth of the sun on our faces... We may find ourselves living our lives through a virtual world to such an extent that we decide to create the perfect partner and marry an avatar.

Politically, the new world will be interesting. Increased social connection will bring people closer. Nationhood could be challenged. Protests will be easier to organise, centralised control by way of governments and national borders weakened or cease to exist, while instead people will align with causes and engage en masse with like-minded individuals across the world. We will all be seeking to align with “our tribe”.

Of course, this brave new world also comes with some drawbacks. We are likely to experience cyber outages as part of a new wave of interference from external players. I am a technology optimist and I love the way that technology improves our lives and offers solutions to previously unsolvable problems. But things can go awry. Witness the recent example of a female doctor trying to gain access to the locker-room whose swipe card refused her entry. After trying unsuccessfully several times, despite swapping her card for a new one, a review of the algorithm granting the system permissions revealed that DOCTOR had been designated as a male job title and not a generic one, so she had been refused entry. There’s a way to go before we succeed in eradicating the biases of the past from our tech. Among the new professions of the future, we have to create roles whose job it is to help people adapt to the new digital environment and sort out the glitches that will inevitably occur along the way.

One final thought. For me, among these new jobs, that of ‘ethicist’ will become increasingly important. Someone has to help us answer the question: “Just because we can create it, should we?”

“ Haptic feedback suits will give us the ability to feel what we watch ”



50 Years

From Now:

Ten advances in transport and infrastructure that will revolutionise lives, by Dr Rhys Morgan

Dr Rhys Morgan is Director of Engineering and Education at the Royal Academy of Engineering, and has taken a leading role in ensuring the education system is appropriate at all levels for developing the next generation of engineers. He predicts that cities will no longer be clogged by traffic jams and that new rapid-transport technology will allow us to arrive in Edinburgh less than 40 minutes after leaving London.

In 50 years' time, your daily commute to work will be unrecognisable – assuming anyone commutes to work then, by no means a certainty in our interconnected future. Travel of any kind will be utterly different. Forget HSR2 – you'll be hopping into a subsonic tube transport system (STTS), a quad pod, a superconductor bus, or even a reusable rocket.

You can also forget traffic jams, traffic cones, roadworks and even driving yourself. Insurance companies will have finally decided that human steering is just too dangerous and should be left to robotic, autonomous driving systems. So we will be saying goodbye to steering wheels in our cars – unless we decide to go retro and pick up a vintage car from 2020. Of course, it is always possible that driving yourself will become actually illegal, except on specialised recreational driving circuits.

As for the gas company digging up the road to repair pipework... a carbon dioxide generating fuel source being used in 2070? Are you crazy? Gas cookers and gas central heating systems will be long gone, so we can say farewell to many roadworks. Our bridges, tunnels and other infrastructure will be continuously monitored by embedded sensors, constantly checking the condition of the structure. As defects and cracks emerge, the material will start to self-heal. How? By employing bacteria that live in a dormant state spread out within a concrete structure. When rainwater or moisture seeps into cracks in the structure, the bacteria 'awake' and start to feed on the water-concrete particle mixture, excreting limestone or other insoluble materials which fill the cracks. This saves further degradation of the structures and prevents their collapse. With self-healing infrastructure, robotic building systems and autonomous vehicles, there will be no more need to close vast sections of roads for repair. Cars will automatically line up behind each other keeping constant speed through restricted sections.

“ It is always possible that driving yourself will become actually illegal, except on specialised recreational driving circuits ”

Traffic systems will be interconnected so you will never miss the connecting train or flight because of delays. Our future cities will be digitally connected in so many ways. It will be the internet of things on steroids. Roads and infrastructure will communicate with vehicles to keep traffic moving constantly. There will be no need for traffic lights; vehicles will slow to allow weaving at junctions, but they will never stop. Cars and trucks will communicate with each other on motorways to allow platooning with gaps of only a few centimetres. Traffic pollution and energy consumption will all be monitored and controlled through artificially intelligent networks.

This, of course, only counts for those areas still using roads at ground level, as 'sky-ways' will be the main routes for aerial taxis and similar vehicles. Never mind hailing a cab on the street. You will step into the nearest available 'pod' and a high power, drone-type quad-copter will lift you up above the buildings and off to your destination. These quad-pods will fly around cities and towns on sky-ways – aerial motorways, enabling easy travel and commutes. Once on the ground, the pods will link with other transport systems for onward long-distance travel.

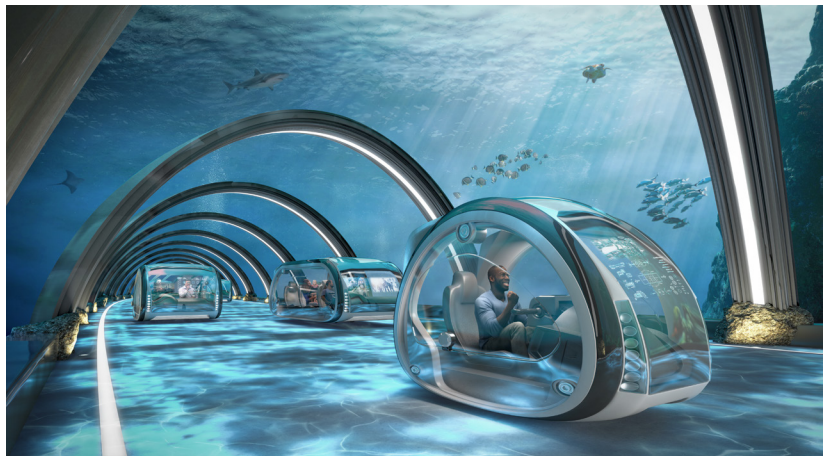
Or you may find yourself stepping onto a superconductor bus, travelling on magnetic levitated superconducting rails, making bus or train rides super smooth, quiet and pollution free, as superconducting materials have zero electrical resistance. This means ultra-high-efficiency travel at low costs. For medium-distance travel (less than 500 miles), a subsonic tube transport system (STTS) will be the quickest way to get there, at speeds of over 750 miles per hour and journey times of under 40 minutes between London and Edinburgh. STTS is a sealed transport system that allows pods to travel with little air resistance or friction, enabling superfast speeds. The tubes can also go under the sea, enabling connections between the UK and mainland Europe as far as Scandinavia in under an hour.

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For longer distances, most city-to-city travel will involve reusable rockets, entering near-space just outside the upper atmosphere, travelling at just under 20,000 miles per hour. Advances taking place already mean that such rockets can take advantage of zero air-resistance to offer incredibly fast journey times: travel from London to New York in under 30 minutes. Those of us who won't be able to afford space commuting will have to continue travelling by old-fashioned aeroplane. These planes, however, will travel at hyper-speed, five or six times the speed of sound – around 3,500 miles per hour, which would mean journey times between London and Sydney of four and a half hours. The engines for these hypersonic planes are already in development, so this future model of travel is certainly coming our way.

The long-heralded ‘clean’ source of energy, nuclear fusion, should finally be with us in 50 years’ time. The hard-to-achieve process of forcing atoms together (fusion) instead of splitting them (fission) has up till recently eluded scientists and engineers, due to the complex processes and very high temperatures and pressures involved, but new developments make fusion power look more realistic than ever. And it will be worth the wait – abundant carbon-free, clean energy, from... seawater.

Will we be holidaying in space? One of the big challenges for space travel is getting off the earth. It needs huge amounts of force to propel us out of our protective atmosphere. But with new advances in super-light, extremely strong materials, we may just solve the problem by developing sky-lifts that transport us the 60 miles upwards to space-ports outside our atmosphere. From the space-port, much lower powered transport systems can reach far-off moons and planets in our solar system. The idea of sky-lifts has been around for well over 50 years already but finally, by using new carbon nanotube-based materials, we are likely to have a realistic chance of achieving this long-held ambition.



In 50 years’ time, we should be well on our way to achieving colonies on Mars. New forms of ion propulsion, far more efficient than current chemical-based rockets, will enable speeds of 90,000 miles per hour. Of course, there are a few other barriers to living or holidaying on Mars: dust storms that can cover half the planet and last for six months at a time; daily temperature swings of 100 degrees C, from a balmy 20 degrees in the daytime to -125 degrees at night. The vacation of a lifetime, but you might need to pack the hot water bottle.



Future Food

How we will eat and socialise 50 years from now, by Dr Morgaine Gaye

Dr Morgaine Gaye is a food futurologist and the director of Bellwether Food Trends, a London-based team that produces a bi-annual compendium of food trends. Her interests lie in exploring all facets of food: why we eat what we eat, how we use food as a social tool and what the future of food looks like. She speculates we could be 3D printing Michelin-starred meals to eat at holographic dinner parties, and suggests some new food sources we might exploit as consumers prefer local and seasonal above all else.

Food is a fashion business, and although in Britain we are proud of our traditions in food and festivals (roast beef and Yorkshire pud, Bakewell tart and custard, the Christmas turkey) part of our cultural DNA is to face outwards and embrace the new, the cool, and always the aspirational – smashed avocado, artisan gin, or whatever the latest foodie trend happens to be. But in a future world with an expanding population, increased pressure on land and resources, and a new awareness of the dangers of climate change, what (and how) are we likely to be eating in 2069?

Think new ingredients. Caci fruit, guanabana, mamey sapote, cashew fruit, cherimoya and lacuma are just a few of the fruits we can expect to see more of. As our climate warms, tropical fruit will be more easily grown closer to home. A whole new world of grains such as kernza and teff will become more available. Nuts such as the pili nut, or macadamia, will become less exotic.

We may have to abandon some prejudices. Fried locust, anyone? Eating insects is common in other cultures and has been discussed earnestly in the West since the 1920s, but a mainstream conversation about entomophagy is fairly recent, sparked by concerns that breeding and farming animals like cows, sheep and pigs uses too much land and resources to be a viable source of non-plant protein in the future – not to mention worries about animal welfare should farming become more intensive. There is still the ‘yuck’ factor to deal with, but eventually insects will become one of our main food resources. Every kitchen will be equipped with counter-top growing pods, with a small harvesting drawer. For the squeamish, the insects do not have to be consumed whole as a recognisable species. Ground insect meal will be in everything from savoury dishes to snacks and cookies. It could be used, as soya protein is now, to create meat substitutes, sausages or mince... and so I can picture a High Street full of Grub-burger takeaways, with young men falling out of the pub to pick up a supper of the Colonel’s Big Value Fried Grasshopper Bucket or, after a particularly drunken night, maybe a greasy worm kebab. De-fatted insect flour will be available for home baking and the fat itself, containing nutritious alpha linolenic acid, used for frying or even in skin care.

Local, as opposed to exotic, will have become the new watchword, as people grow more concerned about food miles and the damage wreaked on the planet by air-freighting and intensive farming so wasteful of water and plastics, which is turning some areas into dust-bowls. So the trend will be towards growing locally and buying seasonally from responsible producers, and even foraging for wild ingredients such as mushrooms, nettles and garlic. There will be a new consciousness of food waste. Single use plastics will have been banned years ago and any food packaging will serve as a refillable container. The most precious commodity of the future will be water. Water will be scarce, and in-built digital faucet systems will flow water in a more economical way, producing drinking water or washing water at our command via the 2069 version of Alexa. Our drinking water will come from special water depositories, guaranteed free from heavy metals, nitrates, hormones, fluoride and other chemicals.

But the biggest change of all, and this is not so distant as you might think, will be the development of tasty, nutritious, synthetic food, indistinguishable from the real thing and produced via digital tech in our own homes. The ‘must-have’ item of kitchen technology that every household will aspire to by 2069 will be a 3D food printer. Deluxe models could even be capable of preparing a Michelin-starred meal to wow your dinner party guests. At the same time, this will dovetail with a trend towards ‘functional food’: food as fuel, delivering the best nutrients for mind and body, as powders, shakes, gels and forms. From human nutrition to dog food, we and our pets will be consuming beautifully designed, delicious edibles made purely from chemicals.

“ The ‘must-have’ item of kitchen technology that every household will aspire to by 2069 will be a 3D food printer ”

Building on that trend, you can forget one-size-fits-all diets. Expect everything you eat and drink to be personalised nutritionally for the individual, packed with all the minerals, vitamins and food groups your body requires. By 2069, we could all have skin-embedded sensory devices to monitor our breath and biometrics to deduce what micro-nutrients and vitamins we individually need each day, signalling which foods we need to eat and when. These devices will be programmed to take into account our genetic background and any pre-existing medical conditions. Dieting will never have been easier, especially as the 3D food printers can be programmed with your own taste preferences.

This in turn will lead to a more fluid approach to eating and perhaps even the erosion of the concept of meal times. Breakfast, lunch and dinner will be events that we only experience very occasionally, when people come together to celebrate and remember with nostalgia how we used to eat in the past. The rest of the time, we'll be 'fuelling up' around 6-8 times per day.

But there will still be parties, and they may well involve some form of food. When you throw a party, thanks to advanced virtual reality technology, your guests can be located anywhere in the world, but will be able to join in the celebrations as holographic presences. The party will take place simultaneously in more than one location, and the invitees can share in everything, including eating the same menu, which will be programmed into their own 3D food printer. (Or, if they utterly loathe what you have chosen for dinner, they might surreptitiously reprogramme to suit themselves and pretend they are enjoying what you have 'cooked' – a tweak of the holographic technology should allow for a little polite duplicity in what they appear to be eating!) These experiential celebrations are likely to grow in popularity thanks to advanced technology. Holographic wall displays will allow us to change the theme of room to suit the vibe, and we can share our home and dinner along with far-flung family members and even celebrity avatars, conjured up using hologram technology. Not only will we see and hear them, but we will even be able to experience a hug or a touch from them, using haptic technology sensors embedded in our clothes.

And now, if you'll excuse me, I must just go and fetch in my drone-delivered takeaway supper. Now there's another technology that isn't far off from becoming a reality...

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The Future of Cities:

**Where and how we will live in 2069,
by Professor Dale Russell**

Professor Dale Russell, Professorial Mentor and Specialist Advisor to Innovation Design Engineering at the Royal College of Art joint course with Imperial College, London and Visiting Professor at Central Saint Martins. Dale is a founding Advisor, Research Associate and Doctorate Supervisor with Design Against Crime Research Centre CSM She is Honorary Fellow of the RCA and Fellow of the RSA. Dale is internationally acknowledged as an interdisciplinary futurist, design practitioner and academic. Her predictions include the future of cities, our urban living space and how and where we might spend our holidays in 2069.

“ The giant anthills of Namibia could become a model for buildings of the future ”

The future is up, down, underwater and in space.

Our cities are growing fast. By 2050 – only 30 years away – it is estimated that more than two-thirds of the world’s population will live in cities. Space for cities to grow is already at a premium, as we need to protect the land to make room for plants and forests that will keep the planet healthy. We have no option but to seek radical solutions. Already bold pioneers are planning for that future, and the cityscape of 2069 will look very different from today.

In the future, people may not think in terms of a life structured as we live today. Gender, family units, and other lifestyle paradigms will be considered through new perspectives as humans develop deeper, more dependent relationships with technology. Large sectors of populations are becoming nomadic, and this could result in new rootless communities evolving and forming new geographic boundaries of state, nation, land, sea or planet. The coming years will have to bring about completely new strategies to deal with sustainability.

Let’s start with up. Picture giant climate-controlled cities enclosed in domes that help to regulate temperature and minimise wind-turbulence between its vast skyscrapers. We are learning so much from Nature itself. The giant anthills of Namibia could become a model for buildings of the future. Their design allows cooling currents of air to regulate the temperature within, even under the hot African sun; we may use the same principles to design the skyscrapers of 2069.

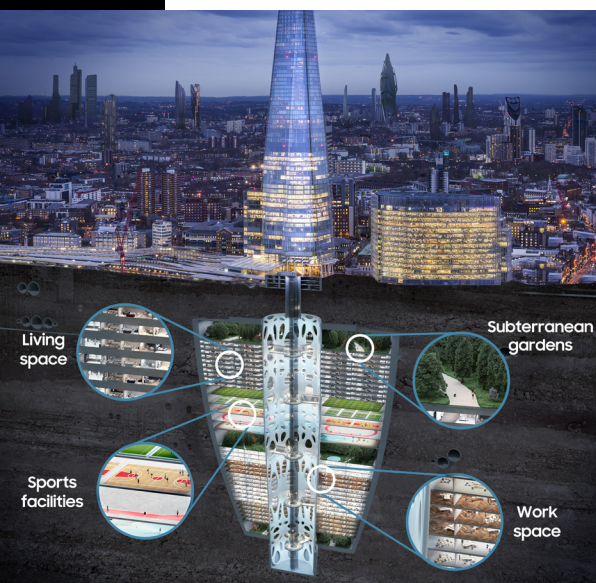
The high-rise buildings would be connected by pedestrian ‘skyways’ at various levels, prioritising walking or cycling, encouraging people who live in the skyscrapers to live active lives, since so much of their work or leisure by 2069 will be conducted passively in front of a screen or through virtual reality technology. The skyways would be maintained by AI technology with a robot workforce. Homes, too, will rely on robots and embedded technologies including self-cleaning. Rainfall-capture systems augment the city’s water supply; wind turbines control air-turbulence and generate energy. Living membranes will convert its carbon dioxide into oxygen.

If this suggests a concrete landscape that is arid and stark, nothing could be further from the truth. The city of the future will be lush with greenery. Hydroponics has been around for many years now, but in the future this agricultural technology will come into its own and transform our cityscapes. The beauty of it is that it does not require soil, instead using nutrient-enhanced water as a growing medium for genetically-modified crops. No need for crop rotation; every aspect of a plant’s growth can be minutely controlled and kept pest- and disease-free. Studies have shown that hydroponics can produce yields 500% greater than conventional soil-based crops.

Every skyscraper will be able to grow its own food supply - cereals, vegetables and fruits – local and tropical. We won’t need to transport food from afar, a massive saving in energy. Algae on the facades of buildings can be cultured for use as biofuels.

Future domed cities, generating their own climate, food supply and resources, could be the model for space cities on planets including Mars. With Elon Musk, Jeff Bezos and Richard Branson already enthusiastic advocates of space tourism, this could begin with space hotels, luxury space stations orbiting the Moon or other planets, generating their own gravity. Later there would be domed structures on the surface, with city infrastructure gradually created around them.

But up is not the only way. Down is an equally credible direction for the cities of the future. Instead of skyscrapers, imagine ‘earthscrapers’, like an inverted skyscraper burrowing downwards for many storeys into the



“ You may find, by 2069, people living and working in deep-sea cities ”

ground. As cities become overcrowded, similar urban sites are planned already, such as Underground Science City, 80 metres below the surface in Singapore. It will house 4.500 people in an earthscraper, with underground developments for retail parks, green city infrastructures, highways, train lines and channels for air-conditioning pipe work. The design is cylindrical, a concept first conceived as long ago as 1931, which will enable it to withstand earthquakes.

Building underground saves space and, ultimately, power. The topography itself can generate energy, the rocks absorbing the sun’s heat in summer to keep the city cool, releasing it in winter like giant radiators to warm the earthscraper. Within such cities, by 2069 we can imagine a complete self-contained travel and eco system underground, again using hydroponic farming systems with artificial light to grow the city’s own food supply.

Burrowing into soil or rock is not the only way to develop downwards. 71% of the Earth’s surface is covered by its oceans. We already have artificial floating islands created off Dubai and Japan – why not whole floating cities? Extend that underwater and you may find, by 2069, people living and working in deep-sea cities. This entirely plausible vision is taken forward with the ‘Blue Garden’ concept, 3,000 – 4,000 metres under the sea. Again, it might start with the idea of deep-sea hotels for adventurous tourists looking for an unusual safari holiday, then develop into whole communities living underwater. A surface hub would enable you to travel in a pod by Hyperloop – a mega-fast pneumatic vacuum-powered tube technology based on frictionless movement, similar to pneumatic customer payment systems once used in department stores between floors from customer to accounts office. A hyperloop tunnel has already been tested in Nevada, using speeds up to 700 miles per hour.

External supplies could be delivered by deep-sea submarine, but most of the underwater city’s resources would be self-generated. Fresh water could be created from sea-water by high-pressure desalination methods, and used for hydroponic farming. Electricity could be generated by ocean current thermal energy conversion – there are many volcanic vents on the sea-bed producing jets of warm water. Windows of thick, pressure-resistant glass would look out onto a floodlit underwater wonderland, giant squid pulsing with colour, sea-slugs rippling across the ocean bed. This, as much as space, is Earth’s ‘final frontier’ – imagine the richness you would experience visiting or living in such a city.

Of course, in 2069 you might decide to experience all this without actually leaving your home. Virtual reality offers energy saving holidays whenever and wherever you want to go, without the hassle of travel, suitable for all levels of disability. No need to brave the rigours of space flight or submarine adventures – just don your haptic body suit, with its neuro-connectors that deliver sensation, and you will be able to feel that tropical breeze on your skin, sense the ocean’s little waves breaking on your toes, taste the tropical delicacies... all without having to move from your armchair.

We are not daydreaming here. All these technologies already exist. Many of these concepts are already in the planning stage. The city of the future is on its way, and will be with us by 2069.





Step Away from the Sugar Bowl:

How virtual companions will
keep you healthy in 2069,
by Maneesh Juneja

Maneesh Juneja is a Digital Health Futurist who explores the convergence of emerging technologies to see how they can make the world a healthier and happier place. He believes that in the future we could be operated on by robot surgeons, our babies gene-edited to eliminate inherited diseases, and healthcare will come to you wherever you happen to be – at home, in the pub, or the office – our wellbeing continuously monitored by sensors in our surroundings, our clothing and our bodies.

Fifty years from now, people will look back and shudder at the 'Dark Ages' of healthcare which we are living (and dying) through now. Just as we are horrified at the thought of operations without anaesthetics or infection treatment before the discovery of antibiotics, our children's children will pity us for the primitive state of medicine in the early 21st century.

The fitness tracker is already with us, but will soon become only one of many sensors embedded all around us monitoring our health: in our beds, our cars, our offices, our bathrooms and even within our bodies, implanted as microchips recording blood pressure, heart rate and other vital signs in a continuous manner. Linked to one giant network, artificial intelligence (AI) will pick up when a sensor detects signs of illness and could automatically book us a doctor's appointment, delivered to our smart watch or other wearable tech. Brain/computer interfaces could read our thoughts and monitor our mental well-being. Architects will use the treasure trove of data generated to design 'healthy' offices, homes and buildings that enable us to stay in optimal health.

There may be a downside – health and life insurance might move entirely to a pay-as-you-live model where your premiums change based on monitored behaviour. If you don't have enough sleep every night and are knocking back a glass or two over the recommended alcohol limits, the sensors will detect your risk has increased and your premium may go up the next month.

Consumers will also have much more control over how their health data is used and who profits from its use. Your data could have a tradeable value, especially to those wanting to perform medical research. You could even use it as a form of payment for healthcare services. Perhaps communities of patients – those living with arthritis, or multiple sclerosis – might come together and pool their data, listing it on a health data stock market, potentially raising incentives for research into diseases that might not otherwise attract funding.

Virtual companions will support our health 24 hours a day. Just like kids are growing up with virtual assistants today, in the future we will have the option of a digital companion that gets to know us and our health over our lives. Through sensors which track our health status wherever we go, they will nudge us to make the healthiest choices, while eating out (full-fat or skinny, carb or gluten free?), while on our way to work (lift or stairs?), or while having fun on holiday (will your heart really take skinny-dipping in an icy sea?) Our digital companion would never judge us, providing us with a safe place to share our feelings and troubles. It could act as a virtual doctor, a virtual therapist or, when we are becoming old and frail and forgetful, our virtual nurse, social care assistant and friend, cueing our smart home to make us a nourishing meal or a comforting cuppa, making sure we take our pills at the right time and don't leave the gas on.

Taking pills will also be simplified. Say goodbye to numerous different tablets taken at different times of day at standard doses for different diseases. Ongoing advances in 3D printing will enable the production of medication of any size, shape or flavour, tailored to your genetic make-up and your body's individual requirements, so each pill (or implant – we may be using subcutaneous delivery of medication) will contain a cocktail of ingredients designed just for you, minimising chances of side effects. Every doctor's office and pharmacy would have a 3D printer capable of printing out such personalised medication. If you can't visit the doctor's office or pharmacy, a drone would bring the medication directly to your bathroom window!

Advances in robotics will impact what happens when we go under the knife. Major surgeries will be handled by hybrid teams comprised of robot surgeons and human surgeons, working in complete harmony, to provide a level of care that is safer, cheaper and quicker than human surgeons

“ 3D bio printing will enable the production of medication of any size, shape or flavour, tailored to your genetic make-up and your body's individual requirements ”

working alone. Many minor surgical procedures will be automated to a point where the procedure could even be performed by robots whilst you commute to the office in your self driving medical taxi. This is all part of the shift from system-centred care to person-centred care, where convenience becomes a much more important factor.

Meanwhile 3D bioprinting of human organs will evolve to a point where “body farms” will provide instant replacements for people whose organs are damaged beyond repair. Already a 3D bioprinter has been sent to the International Space station to grow human tissue in space. For those who can afford it, they will even be able to buy replacements that exceed the original spec of the organs they were born with: eyes with improved vision at night, hearts or lungs that enhance an athlete’s performance, perhaps using a fusion of human and synthetic components

Consumers may be able to buy temporary upgrades and enhancements to their body: strength, endurance, vision, hearing. Initially, consumers will get a brain implant, which presents them with a menu of upgrades that can be subscribed to as and when needed. Upgraded endurance for a hiking trip this weekend? No problem, a cocktail of stimulants and enzymes can be pumped round your body on demand. One in three babies born today in the UK will live to be 100 years old, so a judicious choice of upgrades could have them running a marathon at age 99. Disability could become a thing of the past.

More people will be born healthy. Imagine a future world where it will be possible to genetically edit human embryos to eliminate many inherited diseases such as cystic fibrosis and sickle cell disease. But since it will also be possible to edit for eye colour, hair colour, body type and possibly even IQ, concerns will be raised, demanding a ban on the use of such technology, affordable only for the rich. Of course, it may be that in fifty years’ time costs will have come down, and everyone in the world will be able to choose how their baby looks as well as ensuring that he or she is disease free – though we have to ask ourselves: is this the kind of world we want? The future offers us new benefits, but also new risks, so consumers will need to be included in conversations about the ethics of these new technologies. Those organisations that fail to recognise this shift, are likely to lose the trust of consumers as this becomes a more pressing concern. Nanomedicine – swarms of microscopic nanobots – will be injected in every newborn, to swim around its blood vessels spotting problems and even being able to repair some automatically without recourse to a doctor. Scientists today have already programmed nanobots in mice to shrink cancer tumours. Imagine the possibilities on how cancer can be treated in the later 21st century.

The convergence of emerging technologies will transform many aspects of healthcare over the next 50 years and take us towards new frontiers. There will no longer be queues in GPs’ waiting rooms. Hospital visits will become a rarity. And when it comes to the Big Goodbye...well, we may not yet have a way to conquer death. But we do have, in the next 50 years, the possibility of being able to upload our memories and thoughts into the Cloud. Grieving friends and family might unload the essence of our being into a robot and so interact with a digital version of our past selves – gone, but still here.

“3D bioprinting of human organs will evolve to a point where “body farms” will provide instant replacements for people whose organs are damaged beyond repair.”



A Digital Revolution in Fun:

by Matthew Griffin

Matthew Griffin is an award winning serial entrepreneur, global futurist, author, and keynote speaker, who helps governments, leaders and entrepreneurs around the world demystify the deep future. Matthew predicts that the future of computing and electronics will be biological and biologically inspired, that AI, creative machines, and robots will self-design, self-evolve, and self-replicate. New technologies, including human augmentation, and non-invasive brain machine interfaces will transform how we experience and interact with our world and the world of entertainment.

What will we be doing for fun in 2069? My prediction is that the future will still be comprised of many of the same kind of pastimes that entertain us today, such as watching and participating in sport, enjoying concerts, games, and movies, as well as base jumping off of the cliffs on Neptune – but EVERYTHING will be more intense, more vivid, and more individually tailored. And some of it will blow your mind – literally.

Imagine, for starters, watching Quidditch-style four-dimensional sports matches in a massive stadium, with crowds cheering on players who are astride hover boards or shooting upwards powered by jet packs. Are you actually there? It won't matter. You could be anywhere in the world, because you will feel as if you are genuinely present. The digitally generated immersive worlds of the future, and Virtual Reality, will be that good.

Watching sport will become a full-on neural assault. You will feel it when the future equivalent of Ellen White is tackled by a future Megan Rapinoe in the 2069 Women's World Cup. It will be as if you are actually on the pitch alongside the players – actually part of the team. Meanwhile Artificial Intelligence and a new generation of Creative Machines will let you design any virtual game you like using just your voice or thoughts – no programming or design experience needed – and become the sports star yourself, whether it's base jumping off the cliffs on Neptune or skydiving through the swirling acidic mists of Venus. You could choose to play a virtual game of soccer against the stars of the past, David Beckham or George Best, or quidditch alongside Harry Potter – you choose, it's your experience and world. The norm will be that if you can imagine it, you can create and play it.

“**play a virtual game of soccer against the stars of the past, David Beckham or George Best, or quidditch alongside Harry Potter – if you can imagine it, you can create and play it**”

Effectively the distinction between 'real' sport and computer gaming will be eroded, and you won't be able to tell the difference – the graphics will be that good, they'll be beamed into your brain, and haptics and sensor technology will fool all five of your senses into thinking it's real. The future will offer ever more immersive and convincing virtual reality. Haptic kits already exist, which allow you to experience sensations, via armbands, suits and vests, as well as 360 degree vision via your headset. This kit will become ever more refined, those clunky headsets will disappear, replaced by nano-tech Metalenses and eventually neural interface technologies, and instead there will be affordable haptic full body suits available both for home use and in arcades, and even haptic technology and a wide range of sensors embedded into your everyday clothing – which themselves will be printed on demand using a wide range of new manufacturing technologies such as Holographic 3D printing, and more.

For gamers who cannot afford to equip themselves with the full rig, future amusement arcades will use neural interfaces to hook people directly into the games telepathically. And, if that's not your thing, then rather than standing at an arcade machine, players could just walk into Holodecks, a type of room that uses a range of different technologies, including parallax screens, to create a simulated “virtual” environment in the real world that surrounds the player with digitally simulated sounds, sights, scents, and experiences. In a jungle warfare game, for instance, you would be able to feel the moisture dripping onto your skin, hear the hiss of a snake in the undergrowth, the throb of an approaching helicopter, and smell the perfume of exotic flowers mingled with the stink of your comrades' fear – and not a virtual reality headset, or a neural interface, in sight.

Virtual reality and other new tech will also help ageing sports stars like Beckham and Roger Federer prolong their professional careers. They won't need a human sports coach to lift their game in the future. Real and Virtual Reality training combined with Artificial Intelligence coaches, that are enabled by Machine Vision and data, will allow them to try out an infinite

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number of different plays, while AI will be used to analyse opponents' game play, skills and style, and then coach players in the best strategies to copy it and counter it. In vivo gene editing will also let sports people genetically enhance and augment their physiology to give themselves better reflexes, eyesight, speed and much more. Neuro-prosthetics and neuro-stimulation devices will train their brains so their bodies react faster in order to improve their performance, and athletes will have, by today's standards, super-abilities. Disabled people will also be able to use these same technologies too so that disabilities are no longer seen as an obstacle to performing at the very highest levels – or even exceed them.

But not all sporting contests will be human. Inevitably drones and robots will be playing sports and there could be any number of new ones invented, including space races through the solar system, dodging collisions in the asteroid belt, in the same way that drones today twist and turn through disused warehouses. Given current controversies over allowing disabled athletes with specially designed prostheses to compete alongside able-bodied athletes, imagine the ethical nightmare of determining equitable rules governing future sports contests involving cyborgs, genetically enhanced or physically modified athletes and even animals, and interestingly, CRISPR gene editing tools have already been tried on living patients to eliminate certain genetically inherited diseases, and in 2016 the International Olympic Committee (IOC) started testing for “genetically modified athletes,” a type of “cheating” they refer to as Gene Doping.

As for cinema or theatre, the concept of a screen or a stage will seem quaintly old-fashioned by 2069. We are accustomed to a present-day world where everything is designed and created by people. As AI grows more sophisticated, that will change - dramatically. Increasingly the creators of both artefacts and content will not be human. Artists, authors, bloggers, film makers, musicians, and writers will effectively be redundant. AI will provide the content you desire at any given moment, and can even adapt the storyline on the fly if, using machine vision, sensors, or even your home Wi-Fi, it senses you are getting bored, in order to get you re-engaged with it.

There will be no need to browse Netflix for the kind of show that you want to watch. This ‘procedural content’ will be beamed directly into people's brains using non-invasive neural interfaces – why sit in front of a big screen when you could put customers into the movie and then play that movie in their heads? Neural interfaces connected to AI, the web and other “hive minds” in the cloud, will gauge your mood, assess that you want a laugh with a witty comedy, or perhaps a good weep over a romantic movie, that you'd enjoy it most if it were set in a familiar location and that it featured a character who looked exactly like your first girlfriend – and there it will be, playing in your head.

This frankly all sounds out there, but organisations are already experimenting with brain machine interfaces and opto-electronic devices that use light to affect and modulate the human brain's synapses to edit memories, and download and upload information, and even memories. People will also be able to embed microchips in their brains, using autonomous robotic surgeons, that are capable of taking a digital input and converting it into a bio-electronic signal that the brain can understand in order to gain new mental functionalities such as enhanced memory and recall, for starters, and this embedded technology could offer faster data transfer rates than some of the alternative non-invasive technologies couldn't, but which type of neural interface, invasive or non-invasive, that people choose would be down to them.

As for Glastonbury and other big rock concerts – well, for diehard traditionalists who like to get muddy, it may be that Michael Eavis's great-great-granddaughter will still open Worthy Farm every June for real humans to headline on the Pyramid Stage. Most of us will be linked in to such events,

wherever they happen in the world, via neural links and haptics. But history shows that, from the Monkees and the Bay City Rollers to The Spice Girls and Take That, the music industry is obsessed with creating the perfect combination of looks, talent and malleability in its stars. Unfortunately, humans are unpredictable and eventually they fall out with each other or think they can go solo. At most future rock concerts, the stars will be digital avatars, the music composed and played by AI.

One last idea to boggle over. People will connect, talk and communicate with one another on social media networks telepathically, again using so called “internet scale” neural interfaces, and will be able to access and share “hive minds,” in the same way some robots “share minds,” using AI and the cloud, today. As bizarre as this sounds, the former technology is already emerging and Facebook’s CEO, Mark Zuckerberg, has said he wants “...to turn Facebook into the world’s first telepathic network,” and his team have already made huge progress. However, it will take decades before anyone manages to sort out the necessary regulatory and ethical approvals to allow this sort of technology to get to market – just imagine the privacy settings your account (or brain) would need!

Greg Foot - Reflection

Greg Foot is a Presenter and Producer of TV & radio science programs for the BBC, recently hosting a BBC Radio 4 series that separated facts from fads, and a BBC World News TV series investigating the future of food. Greg is also a successful EduTuber with his YouTube videos amassing over 30 million views on his own channel and those he hosts for the likes of BBC Earth. Greg's passion is making science accessible - for children & families through exciting demos on Sunday Brunch, Blue Peter and at live events; for scientists with the 'first YouTube Course on Science Communication'; and for various clients around the world with his newly launched Science Media Studio - a digital-first production company making YouTube videos, Podcasts & live shows.

We curious humans have always loved to look ahead and predict what inventions and innovations may be just around the corner. If you'd been at the 1900 World Fair in Paris, you'd have been in amongst just such a hotbed of speculation with Victorian thinkers and tinkerers presenting how they thought the people of the 21st Century (us) would be living their lives. Some predictions were pretty accurate – from airplanes to mobile phones – but others were a little more far-fetched. Sadly, we don't load our houses onto steam trains when we fancy a change of scene, and we don't make regular visits to a mechanical automated barbershop.

Carrying on that tradition, it's fascinating to hear what six experts thoughts are on what a future, fifty years from now, could look like. Although some of their predictions may seem as outlandish as the steampunk future the Victorians had planned for us, they are all based on technologies that exist, or are being developed, right now. Although each academic speaks from their particular area of expertise, together they paint a remarkably coherent picture of a digital future that's smoothly integrated with the very leading edge of technology.

Thinking first about how we may be living 50 years from now, Professor Dale Russell paints a compelling picture for how our urban spaces might be transformed. High-rise buildings are already a common sight in cities around the globe, and as urban populations grow, supertall skyscrapers may be all but unrecognisable beneath lush walls of greenery. As the future city strives to provide food and fuel for its growing population, she says it will increasingly turn to hydroponics in vertical farms. By planting vertically, we would be making the best possible use of the limited space available to us within the city, allowing more sustainable farming practices in our rural areas - benefiting both biodiversity and the condition of the Earth itself. I love the idea of a skyscraper community being almost entirely self-sufficient, with food for its residents grown on the walls and waste being recycled and supplemented with algae for biofuel energy.

Onto food next; I recently presented a series for BBC World News called Follow the Food that looks at how we need to redesign our current food supply chain for the future, making it less wasteful, inefficient, and unsustainable for our growing population. Dr Morgaine Gaye's comments therefore really resonate with me. We have only 30 growing seasons left until the number of the people on the planet could exceed 10 billion - these people will all need feeding, and it's likely that we'll be making use of alternative sources to make sure that happens. As Dr Gaye says, we

will need to be eating food that is grown locally, and seasonally, in order to reduce emissions and wastage. Smart farming systems like computer-controlled irrigation could make this local growth more productive than ever, and even allow exotic delicacies to become dinnertime staples. I for one can't wait to try my first grub burger!

Even though food will be grown locally, people will still need to get from place to place, and it goes without saying that in fifty years from now, our transport system will be completely transformed. Several cars are now available with semi-automatic modes that let you take a 'hands-off' approach to driving and the future, according to Rhys Morgan, will see us taking our eyes, and eventually our minds off the road.. The idea of an army of bacteria lying dormant within our roads, waiting for a crack to let moisture seep in and activate them, so they can secrete limestone to seal up the damage is just unbelievably cool. It's such an elegant solution and it's already been shown to work in principle. And I love the sound of an Aquatic Highway that could get us from London to New York in an hour!

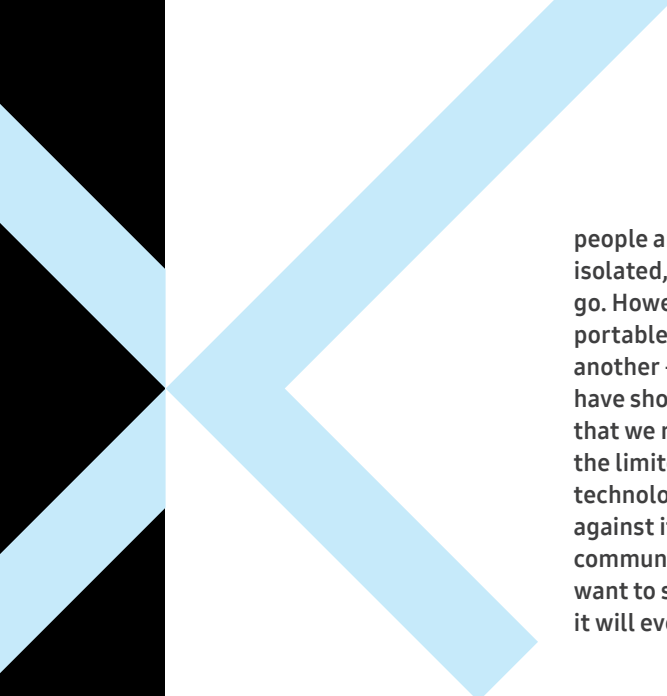
However, not all of the solutions to our problems will be so biological. We already rely heavily on computers in all aspects of our lives, and Jaqueline de Rojas believes that artificial intelligence and complex automation will soon take over all the mundane aspects of our lives. This means a future with careers in fields that might not even exist right now and, as a result, ongoing education will be absolutely critical to help us keep up with the rapid pace of change in our high-tech world. The internet already has a seemingly infinite pool of learning resources on every imaginable topic, but I look forward to a future where this is free, well-organised, and accessible for all.

Advances in technology will also change the way we consume our entertainment. Matthew Griffin says that we can wave goodbye to passively consuming content on a two-dimensional screen – instead we'll be using virtual reality and haptic feedback to enter the game, story, or wherever your imagination takes us. When we choose to participate in sports, the next fifty years could potentially transform the playing field, as it were, as advances in prosthetics and performance aids could see para-athletes competing alongside able-bodied people, and future sportspeople might receive their training from AI coaches, tailoring exercises to each individual on the basis of their personal performance data.

The collection, analysis and use of fitness data is also central to Maneesh Juneja's predictions of our future healthcare. We are already collecting vast quantities of real-time data through our wearable tech and that's set to only increase. The information it provides could help us to receive the correct treatment, in good time, which would save lives, and critically reduce pressure on our healthcare services.

You might have noticed a common theme in many of these future predictions - the use of data to make our lives easier. Data can be collected from innumerable sources: from our bodies, our minds, our habits online, our homes, our cities. Jaqueline de Rojas describes it as a potential 'data lake', which, in the right hands, could streamline and simplify so many things. No more ill-fitting clothes, no more fad diets, and no more wasted electricity. But despite the exciting possibilities, these concepts raise questions about the ethics and privacy of our future, data-driven world. I believe that the biggest obstacle to many of these wonderful predictions is the maze of ethical decisions that need to be considered, assessed, and legislated. Overcome those, and the new digital world is our oyster.

One final thought. There's no denying that the future will be even more reliant on technology. But with this increasing bond with tech, some



people are understandably worried that we risk becoming remote and isolated, just us in a room, with our gadgets taking us wherever we want to go. However, I believe that, as technology becomes more integrated, more portable, and more personal, it will actually help us reconnect with one another - and with our world - in entirely new ways. Lessons from the past have shown us that we, as a species, need to stay connected to the planet that we rely on – to care for it, to keep it clean, and to carefully manage the limited resources it supplies. I hope our future will be one in which technological advancements work alongside nature, rather than fight against it. To make this a success, we all have our roles to play, and through communication and collaboration we can each help shape the future we want to see. I can't wait to see what the next 50 years will bring... perhaps it will even involve that Victorian-predicted robotic hairdresser!