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DEBATE ABOUT OUR FUTURE STARTS HERE

Shayne Currie, NZ Herald editor



ho doesn't love to look forward? I was recently in a second-hand bookshop, thumbing through the *Book of Predictions*, published in 1981.

"By 2015", predicted the author, "the first permanent colony on the moon will open. Its primary function will be mining material for satellites." Granted, we still have a little over a year to go, but I think we'll miss this particular deadline. Same too, perhaps, for the *Jetson*-like cars I was once convinced we'd be flying by 2020.

With any birthday it's customary to reflect on the past but as we celebrate the *NZ Herald*'s 150th anniversary, we've been determined to also look forward.

Today, in collaboration with Massey University, we consider and debate New Zealand's future prospects – for families, our health, population, business, trade and our cities. Some of the *Herald*'s best journalists and commentators, along with Massey's experts, offer insight into how we're travelling, into 2014 and beyond.

There's a lot to be optimistic about, from our opportunities in agribusiness to the wide range of industries that offer so much growth potential. But we also face crucial questions: how do we create jobs

AS WE CELEBRATE THE NZ HERALD'S 150TH ANNIVERSARY, WE'VE BEEN DETERMINED TO ALSO LOOK FORWARD.

that keep our kids in Godzone, the choices we face over energy technology and how to make the most of our ageing population.

Massey political commentator Claire Robinson tells us how she thinks the 2014 election will play out, while her colleague Richard Shaw outlines its key issues.

As the internet, social networking

and smartphones have revolutionised the way we communicate, so, too, will future gadgets. Some seem a little scary, blurring the line between objects and bodies, with embedded medical devices that relay information to doctors.

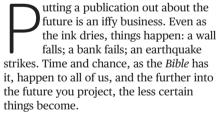
Here at the *Herald*, we know only too well that change is constant. With a record daily print and online audience of more than 800,000 people, we're forging our way in the digital age. As our audience habits change, we need to be a step ahead to meet their demands.

Just as we've led the debate over the past 150 years, so, too, we want to spark discussion around the future. There's no better time to start than here.

Thank you to Massey for supporting and contributing to what we are planning to be an annual publication. And who knows? By this time next year we may be closer to a moon colony.

INTELLIGENT INVESTMENT IS THE KEY

Steve Maharey, Vice-Chancellor of Massey University



The ideas that capture the imagination are often the ones that are novel or nicely counterintuitive. Saying that what lies ahead will be a modified version of what went before makes for dull dinner table conversation. Disruptive change is much more fun.

But drawing on the evidence of past performance can be a more useful approach – and I believe a programme of intelligent investment is called for.

We are a small, isolated, well-educated, socially cohesive nation. We are blessed with fertile soils, a temperate climate, and the most innovative and forward-thinking community of farmers and horticulturalists in the world. In the 1960s we were known as Britain's farm; now, increasingly, we are China's. We have universities that, despite

our tiny population base, are world class.

Here is one of my investment tips. Agrifood. There is money to be made. In 2010, Nestle, the world's largest food company, earned US\$105bn (\$127bn) of which US\$32bn was profit. Despite recent missteps, we know we are good at agrifood; we cannot go far wrong. We just need to be more strategic about we how do things.

Earlier this year Minister Steven Joyce launched the second stage of FoodHQ, Food Innovation New Zealand, bringing together a partnership between AgResearch, Fonterra, Massey University, Plant & Food Research, the Riddet Institute and the Bio Commerce Centre. This is the way things should be trending.

Here is another tip, this one addressing a weakness. Literacy. Recently Massey's Institute of Education conducted a study looking at the success, or lack of, that New Zealand has had in addressing the large gap between our high-performing and low-performing students. Their verdict? The past decade's approach has not made any significant difference. We urgently need to fix this, both because an educated and

flexible workforce is vital to our economic success and because, if we do not, the social consequences will wreak havoc with the society to which most us aspire.

So, allow the Massey University and *NZ Herald* authors of this publication some latitude. Sometimes they will be right; sometimes not. And, more importantly, think about the sort of future you want. There are choices to be made.

Finally, I would like to say thank you to Massey's partner in this publication, the NZ Herald, which is celebrating its 150th anniversary. This publication fits well with its history of informing and inviting public debate. And I would like to issue an invitation. Next year Massey University celebrates its 87 years as a degree-granting tertiary institution, 50 years as an independent university, and the 21st birthday of its Albany campus, which has become part of the fabric of the North Shore and the Auckland region. If you haven't visited the Albany campus, make sure you do so, and if you are one of Massey's alumni community, make sure you come along to our Jubilee events.



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Technology will blur the line between objects and our bodies over the next decades

FUTURE NZ

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ELECTION 2014 WHO WILL WIN AND WHY?



If history repeats itself the National Party will be re-elected next year, and there's little Labour can probably do about it, writes **Claire Robinson**

f recent history is anything to go by, the 2014 general election result has already been decided. Since 1998, the party leading the opinion polls in July of the year preceding the election has gone on to win the highest proportion of the party vote, enabling them to form a government.

Despite the current centre-left Labour/ Greens bloc looking competitive, history says National should have the 2014 election in the bag, again.

How is this possible when there is a lot of water to go under the bridge between now and the next election? Labour's new leader has only just been decided, and so far not a single cent of money has been spent on campaign material by any political party. Surely voters will wait to see what tricks David Cunliffe can pull out of Labour's hat before coming to a decision?

Well, it's counter-intuitive, but election campaigns in New Zealand don't actually make much difference to the outcome of elections for major parties (although they do for minor parties). Data gathered from the New Zealand Election Study since 1999 shows that on average almost 54 per cent of voters make their decision who to vote for before the election campaign. While pre-existing party loyalty is a significant factor in the voting choice of these "early deciders", international research shows that they also base their decision on performance measures they already know or

DESPITE THE CURRENT CENTRE-LEFT LABOUR/GREENS BLOC LOOKING COMPETITIVE, HISTORY SAYS NATIONAL SHOULD HAVE THE 2014 ELECTION IN THE BAG. AGAIN.

estimate well out from the campaign.

Some 62.7 per cent of National voters make their voting decisions before the election campaign; 40.4 per cent of them make that decision before election year. It is these voters Labour needs to reach.

Cunliffe will need to convince National voters that his recent rekindling of Labour's relationship with the union movement is

Labour leader David Cunliffe will be going

also in their interests. It may have worked to shore up his leadership ambitions, but persuading more conservative centre-right voters to swing to the left will not be an easy ask.

Without being able to rely on these voters, Cunliffe will have to share the spotlight with the Greens' Russel Norman and Metiria Turei in order to present a viable alternative to a National-led government. This isn't necessarily an easy coalition. The closer they get to Labour, the Greens risk becoming regarded as "Labour-lite". If they are to grow their support base they need to keep taking voters off Labour. Conversely, for Labour to grow they need to take votes off the Greens, which means that they can't become too chummy either. It won't be easy for either party to present itself as a unified offering when deep down they are competing for the same votes.

Although Cunliffe emerged from the Labour leadership "primary" with all guns blazing, recent political history also suggests he will find it hard to make a sustained impact within the next 12

ELECTION 2014

1LEADERSHIP

those of the government.

up against a man who has already won two elections. Labour's campaign rhetoric will emphasise Cunliffe's mix of ministerial experience and (relatively) youthful energy; the Government will take every opportunity to remind people of the value of John Key's six years in the top job. Recent polls indicate Cunliffe is off to a good start. He has reconnected with organised labour, taken the attack to the Government, and is re-establishing Labour as the official Opposition. He is also slowly shifting the terms of the debate between the two major parties, emphasising policies that not only distinguish his Labour from earlier versions, but also clearly delineates its positions on fundamental issues from

2 INEOUALITY

As a nation we're fond of telling ourselves NZ is a great place for kids to grow up. But the material circumstances in which many Kiwis live reveal these myths for what they are. The Ministry of Social Development's 2013 Household Incomes Report shows as many as 25 per cent of children live in poverty. The increase in income inequality in this country between 1985 and the late 2000s was the largest among all OECD countries except Sweden. The increasingly unequal distribution of income will be a battleground in the 2014 campaign. National's view that people are largely responsible for the circumstances in which they find themselves will be pitted against Labour's narrative - that we should be doing a better job of caring for those among us who are suffering.





months. The MMP era is littered with major party leaders who have rolled their predecessors with the hope of doing better within two to three years of the next election, only to fall by the way. John Key is the exception as leader of the Opposition for just under two years before he became prime minister. No one has yet gone on to lead a government within 12 months of assuming party leadership.

Of course, none of this means that forming the next government will be easy for National. Its current support parties - ACT, United Future and the Maori Party – have all recently suffered serious reputational damage and declining popularity. The wildcard is, of course, NZ First. Assuming that the party gets over the 5 per cent threshold, its options are to go into coalition with National, go into coalition with Labour and the Greens, or remain on the cross benches and vote issue by issue.

With a party membership that has previously indicated a preference not to be in formal coalition with National, and faced with the alternative prospect of being the third (and least important) party in a Labour/Greens coalition, the most likely scenario is that NZ First will choose to stay on the cross benches, supporting a minority National government on confidence and supply, much as it did for the 2005-2008 Labour-led government.

But there is an even wilder card that may yet disrupt this scenario: the Conservative Party. In the 2011 election it got 2.65 per cent of the party vote, which is more than any of National's coalition partners. Off the back of population increases it is possible a new electorate may be formed north of Auckland, currently a National-leaning geopolitical zone. It would not be without precedent for National to "gift' the winning of that electorate to party leader Colin Craig to ensure that the Conservatives' party vote may be counted in a new centre-right coalition bloc. National might then be able to govern without the support of NZ First. Professor Claire Robinson is a political commentator and Pro Vice-Chancellor of Massey University's College of Creative Arts.

GOING UP

Interest rates

Interest rates are on their way up as the economy strengthens and the rebuild of Christchurch gets underway. The only question is when.

The most popular pick is the March Monetary Policy Statement. Interest rates for maturities longer than the Official Cash Rate show higher yields for stock with longer maturities. Some of this reflects compensation to investors for tying up their funds for longer terms, but the important factor is interest rates on average are expected to be higher. This relationship is clear if you look at the swap rates that are the basis for banks' setting of fixed loan interest rates and the 90-day bank bill rate over the same period. The three-year swap rate was at 3.90 per cent last month. This means that the average 90-day bank bill rate over the same three-year period should be similar - but this can only occur if we are going to have bank bill rates significantly higher than the present 2.65 to 2.70 per cent. In October 2012, the three-year swap rate was at around 2.75 per cent. The substantial increase since is a reflection of a market view that increases in interest rates are now much closer. Is it a certainty? No. If global economic conditions worsen and the Reserve Bank holds the OCR at current levels, that means dour economies elsewhere. Our only comfort might be that conditions are less grave here than elsewhere. Associate Professor David Tripe

3 THE COST OF HOUSING

The effects of the Reserve Bank's decision to restrict banks' lending to prospective house buyers are starting to be felt. This is also an issue where the ideological lines are clearly drawn. In order to build 100,000 affordable homes for first-home buvers. Labour has promised "the largest public building programme in over 50 years". National has sought to ease the way for private sector housing construction, offering first-home buyers the chance to buy an ex-state house outside the main centres. There are two issues in play here. One concerns the fundamentally different roles for the state reflected in each party's approach; the other has to do with people's abilities to distinguish the decisions of an independent central bank from the preferences of the government.

4 PRICE OF ELECTRICITY

The differences between the parties on housing policy are, if anything, more starkly drawn with electricity. Again, there are really two things bundled up here. One concerns the disposal of state assets; the other, increases in the price of electricity. The major parties' preferences on the first, and views about how best to tackle the second, are grounded in opposing ideological positions. National, which has made partial asset sales a central element of its second term policy agenda, has turned to the market to resolve matters with partial privatisation. Labour has promised to establish a new state agency which would act as a single buyer of wholesale electricity, and also have the authority to set power prices. The first strategy reduces the reach of the state; the second expands it.

5 MAORI AND THE STATE

Race relations almost always features in election campaigns and can have a powerful bearing on the tone and tenor of political debate. Next year is different, however, in that it signals the end of the historical Treaty settlements process. How the mainstream political parties position themselves for the new post-settlement environment will have a big effect on how they renegotiate their relationships with the Maori political community. Look for a change in rhetoric away from the language of settling grievances to a discourse of boosting Maori economic and social development. The conversation will focus not on divisions (real or perceived) but on how the "Maori economy" and Maori aspirations for development can be harnessed for the collective good.

A TALE OF TWO FUTURES

New Zealand, like the rest of the world, is currently at an energy crossroads. We have two possible futures which will be determined by the social and political choices we make today. As a nation we can go down the business-as-usual, fossil fuel route, or we can work towards a future based on clean energy and technologies. **Professor Ralph Sims** explores what our daily lives may look like under two very different scenarios

hat follows is a peek into two possible New Zealands, each at the extreme end of what our future may look like.

New Zealand in 40 years time might end up being somewhere between these two scenarios leaving the question: what sort of world do we want future generations to inherit?

If we are to successfully transition to a sustainable clean energy future, then significant investment in appropriate research and development needs to be made today. In 40 years time will we wonder why drastic steps to combat climate change weren't taken earlier?

BLEAK HOUSE

It is 2050 and we live in a world where record-high temperatures are a common occurrence and power costs are expensive as fossil fuels become depleted or harder to extract. There is increased competition for water because the upstream water from most rivers is diverted to increase irrigation for farming during much drier summers.

The hot, dry conditions affect food production as well as the power output

from gas and coal-fired power stations since the water used for cooling the plants is now several degrees warmer. As a result of basic thermodynamics, thermal power plants now run at considerably lower efficiencies and have to be shut down during periods of high temperatures. Increased energy demands for air-conditioning cooling in buildings have led to higher demands, power price spikes and further environmental damage.

Traffic congestion in urban centres now approaches gridlock at peak times and flooding has become increasingly common as rivers routinely break their levees. Ratepayers face hefty rate increases as everhigher stop-banks are needed.

Because of New Zealand's failure to invest more than 0.2 per cent of GDP in research and development in the past, other countries – especially China and India – now control the operation of carbon dioxide capture and storage systems and the manufacture of solar panels, wind turbines, electric vehicles and fuel cells.

As carbon prices continue to soar and uranium, oil and liquefied natural gas become increasingly scarce, the country's economy is crippled by the investment now needed to switch to 100 per cent renewable energy sources that were talked about earlier this century but never fully developed. This is further hampered because government funds need to be diverted to pay for critical climate adaption measures. These include renewing building foundations collapsing due to the underlying clay sub-soil drying out during summer and further height increases and strengthening needed for coastal levees as sea levels continue to rise.

New Zealanders no longer enjoy an easy-going culture as extreme weather events impact our lives and livelihoods.

GREAT EXPECTATIONS

Council District Plans across New Zealand have required that all new buildings have energy saving and clean energy technologies installed, as well as encouraging simple conversions of existing buildings.

There have been major investments in public transport infrastructure, including an electric bus and rail system in all cities and an automatic super-conductor "high-railway network" that combines driverless, electric, road and rail vehicles. Commuter road vehicles have "artificial photosynthesis" coatings integrated into their paintwork, and when they reach the superconductor high-railways, the system takes full control of the vehicle.

Traditional hydropower plants still exist – but only to provide base load stability, resulting in a fully decarbonised, reliable and cost-effective electricity supply system.

Perceived problems constraining the target of 100 per cent renewable electricity caused by the variability of wind and solar power have been overcome by accurate weather forecasting, the integration of demand-side management controls,

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and the construction of back-up bioenergy combined heat and power plants.

These plants also produce the co-product "biochar", which generates revenue through valuable carbon credits but also improves soil quality. As a result, crop and pasture yields are higher, irrigation demands are less, and carbon is removed from the atmosphere.

These biomass conversion technologies, combined with carbon capture and storage developments, mean that negative global carbon emissions can actually be achieved within the next decade. This goal is essential if the planet is to keep below the maximum 2°C warming as agreed by all countries in 2009.

Many urban areas have become "biophilic" with plants and wildlife closely integrated with the buildings and transport infrastructure. Most buildings have solar power coupled with energy storage systems integrated with efficient electric-powered, commuter transport "pods".

All unused organic material is collected for use in bio-refinery plants that produce

WITH ALL THESE SMART APPLIANCES RUNNING EACH HOUSE BECOMES ITS OWN MICRO-GENERATOR.

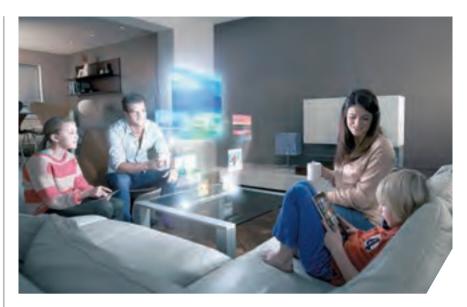
a range of bio-products, including liquid biofuels and the 2000 or more chemicals that used to be produced from crude oil. So local employment opportunities close to residential areas are commonplace.

All buildings have "smart meters" installed that enable the occupiers to save money by avoiding peak power charges and to earn revenue by selling excess power generated by efficient solar panels, microturbines and wind turbines back to the grid. Electric vehicles have become part of the domestic energy system and used as energy storage devices when needed.

With all these smart appliances running, each house becomes its own micro-generator. Neighbourhoods effectively have their own virtual power station because a central internet-based system controls the varying supply/load balance from all the buildings.

Communities also own fleets of vehicles available for residents to hire on occasions when high-speed rail services or their usual commuter vehicles are unsuitable.

Ralph Sims is Professor of Sustainable
Energy with Massey University's School of
Engineering and Advanced Technology.



WHAT WAS YOUR HOME THINKING?

Hans Guesgen is a Professor of Computer Science in Massey University's School of Engineering and Advanced Technology



e're all used to automatic security lights and washing machines that choose the best programme for their loads. But in the coming decades our homes will become really smart. They will have ambient intelligence – the ability to understand what we intend to do.

Ambient intelligence describes pervasive computer systems that run programmes inspired by artificial intelligence. Researchers are developing systems that observe the inhabitants of smart homes in unobtrusive ways through sensors that then interpret the data produced to recognise behaviours.

Simple sensors such as motion sensors, power sensors registering the use of appliances, or contact switches on cupboard doors are the preferred options. These sensors produce a continuous stream of data that can be fed into a computer programme that uses methods from artificial intelligence and machine learning to find out what is happening in the house. Once the smart home knows what's going on, it can take appropriate actions to provide support, reassurance, assistance, or comfort to the inhabitant.

But how do we communicate with our smart home? Our lives have already become highly connected through a variety of devices. Receiving a message on a smartphone and then posting it on Facebook so that others can download it onto their PC is not something that raises eyebrows anymore. Taking this to the next level means incorporating nonhuman entities into our communication networks.

In the future our houses will be able to adjust to our needs. For example, if you sat down in the lounge in the afternoon with the TV switched on, it would know you were watching the latest episode of your favourite show, and since this would take an hour, it would increase the temperature in the room to suit. If you wanted to make a shopping list at the same time, it would check the fridge and display what needed replacing next to the programme on your TV.

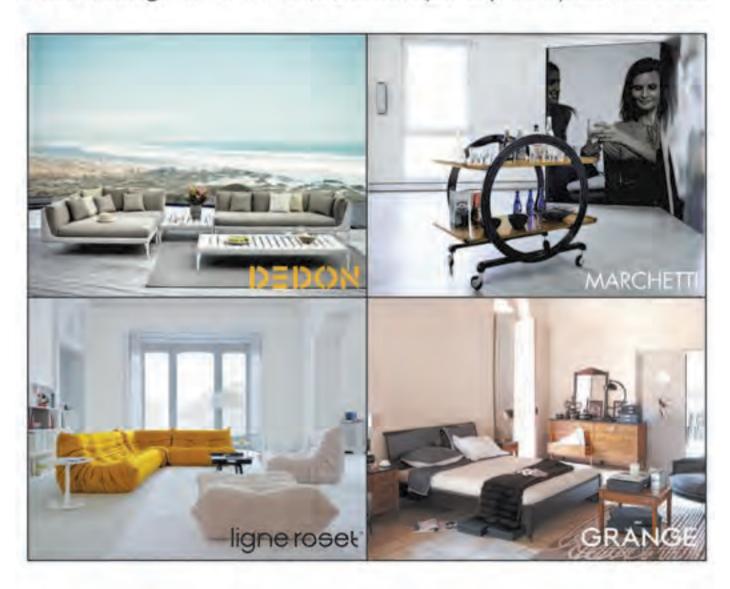
The push needed to make this happen is being driven by demographics. Most developed countries have ageing populations and smart homes will give older people the ability to live independently in their own homes for longer.

Today if you came home and your house was cold and dark, you might wonder what was wrong with your heat pump, or whether a light bulb had blown. In the future you might ask what your home was thinking.



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LIFE IN THE WORKPLACE

The way we work is going to change dramatically in the future as companies struggle to maintain creativity while achieving mobility, in a cost-effective way

ven today "work" is no longer a place you go; it's what you do and how you do it. The changing nature of work has enormous implications for how we structure organisations and manage people.

"It's not just our day-to-day working conditions and habits that are changing, but also our working consciousness", says Associate Professor Ian Laird from Massey University's School of Public Health. "The needs of a low-carbon economy, rapid advances in technology, increasing globalisation, and profound changes in longevity, demography and social norms are all shaping the way we work and the places we do that work."

One thing that's clear is the workplace of the future will not be the same for everyone. Those in the retail and service industries will still be constrained to some extent to the shopfront, predicts Professor Jarrod Haar from Massey's School of Management. "It's hard to imagine a future where people won't want the social experience of dining out, for example, so we'll



still need chefs and waiting staff on site."

It's the professional employee who is likely to spend most of their time in a virtual workspace. People will work outside the traditional office in places they choose or need to be to do their work.

Some organisations have already started their transformation into highly mobile workplaces, while others are struggling to understand what the future means. According to Dr Laird, maintaining creativity while achieving mobility in a cost-effective manner is the most significant leadership challenge facing senior executives today.

Balancing the needs of individual work – a space in which to concentrate and get work done – and the need for interaction means that most workplaces will want staff to have some face-to-face time.

SCHOOLS BEYOND THE DIGITAL HORIZON Professor Mark Brown

The once prestigious *Encyclopaedia Britannica* published its final print edition last year. In just 15 years Google and Wikipedia have taken over its role as a source of academic knowledge.

The rapid growth of
Wikipedia is a useful metaphor for how the future
often lives in the past.
It illustrates how, in the
digital age, academic knowledge is no longer restricted to
formal educational settings. But
the idea that a comprehensive
encyclopaedia provides a valuable source
of academic knowledge remains – albeit
now in a more accessible digital format.

Is new digital technology really making our children smarter? Should we restrict

access to technology in the classroom so real thinking can take place? Moral panics about such issues will continue because new technology does not easily mesh with

> traditional classrooms and many parents expect their children to be well prepared in "the basics".

If technology is to transform our education system, then it must be made accessible to all. Without a deliberate decision to promote digital inclusion there will be a growing gap between the haves and the have-nots.

But there is no doubt that the new digital world has the potential to flip the classroom around to a more socially interactive and engaging process where students take charge of their own learning. Traditional models of education are already being challenged – who could have predicted the growth of Massive Open Online Courses (MOOCs) from some of the world's elite universities even 10 years ago? MOOCs may end up being the education system's iTunes, leading to a transformation in the way education is delivered.

Technology creates the ability to be more flexible in the classroom. In the future we may decide to group students quite differently with a more diverse range of age, skill and knowledge levels. Classrooms may become innovation hubs where small groups of students work together on real-world problems and share solutions with a global audience.

We have the opportunity to give students more control over their learning,

IN THE FUTURE MOST WORKPLACES WILL HAVE FEWER DEDICATED DESKS AND ARE FORECAST TO BE ALMOST A FIFTH SMALLER THAN TODAY'S OFFICES.

IAN LAIRD

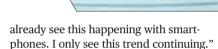
Flexible offices, with different kinds of unassigned workspaces offering both quiet spaces and areas suitable for group work, are already a growing trend.

"In the future most workplaces will have fewer dedicated desks and are forecast to be almost a fifth smaller than today's offices," Dr Laird says. "Instead, spaces will be redesigned to provide inspiration, encourage collaboration and promote health and wellbeing."

Professor Haar predicts that most professionals will have one day per week when they will meet with their team and manager in person. On other days meetings "will take place in a virtual office where you're assigned tasks by your manager with your virtual team members around you".

"Work-from-home options typically stall around issues of trust between the manager and the employee, but in the future workplaces will be so highly wired that monitoring employees will be easy, no matter where they are," he says.

"Technology also puts pressure on workers to work longer hours – we



The ability to adapt to changing technology will become one of the most sought after attributes of any employee, Professor Haar says. Some jobs will be conducted differently because of new technology; others will be completely new.

"In 30 years time, as many as 50 per cent of the jobs will be ones that no one has ever heard of today. Workers will need an even broader array of skills to enable them to be flexible and adapt to changing employment needs. The future employee will be ever training and updating to maximise their performance and employment opportunities."

proceeding at their own pace, but also learning more through sharing and teaching each other. A classroom might be a virtual place where you go to connect online with classmates throughout the country or the world.

Trends such as unschooling and home schooling may become more mainstream as it becomes easier to connect away from a traditional classroom, with teachers taking on the role of a knowledgeable facilitator to enhance shared learning experiences.

Classrooms will be more seamlessly connected to home and other spaces to encourage authentic problem-solving and collaboration. The division between formal and informal learning will be less defined.

We may see the national curriculum adopt a more global dimension allowing

students to move into tertiary study at a global institution of their choice. However, face-to-face time in physical classrooms is likely to still play an important role in maintaining our unique culture and heritage.

These changes will not be universally welcomed and they are not inevitable. Whether schooling should focus on knowledge or skills is already debated and, so far, our education system has remained resilient to technological changes.

Rather than accepting educational change as glacial, our future depends on deciding what type of education system and technology we require to serve the needs of New Zealand's future citizens. Professor Mark Brown is the director of the National Centre for Teaching and Learning at Massey University.

FAMILIES

Traditional concepts of family are changing. "Married with children" was long the paradigm: but the past decades have seen this erode, to be replaced by more fluid and inclusive concepts of family.

In the last 30 years New Zealand has grown from 3.2 million (1983) to 4.2 million in 2013, and as our numbers have increased, so has our familial diversity.

Statistics NZ has undertaken projections on family life between now and 2030. One prediction is that couples without children will overtake couples with two children as the most common household group. The number of people living alone is also set to increase; 602,000 by the 2030s. Many of those will be older people with grown families, who have lost a partner. But both single and partnered older people will be more engaged with the care of the family over the next 30 years.

An OECD study entitled "The Future of Families to 2030" says current baby boomers are the new "young old" who will continue to be active and take care of younger family members, while their children work.

The same study states that increased employer demands for flexible/casual workers will see the development of 24/7 childcare centres.

The recent Marriage Equality Act, and proposed changes to adoption laws, will also change the face of the family. Married samesex couples are now legally able to adopt, and this is likely to lead to an increasing number of children being raised by same sex parents. Proposed changes to adoption laws will allow people to be considered for adoption regardless of their sexuality, age, relationship status or gender. This will mean that single, older and unmarried parents of all sexual identities could create families with adopted children.

*All NZ figures from Statistics NZ





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SIT BACK, **RELAX** AND LOG ON

Technology is playing an increasingly dominant role as our connector, entertainer, babysitter and teacher. **Joanna Mathers** explores how Kiwis will play in the coming decades

onnection – it's one of the hallmarks of our digital age. Be it by computer, smart phone or tablet, much of our leisure time is spent engaging with others digitally. Platforms such as Twitter, and Facebook enable us to disseminate our thoughts, feelings and images to a potentially global audience; new connections can be made with the click of a mouse or the touch of a screen.

But paradoxically, this growth in opportunities for connection may lead to increased isolation. Dr Martin Paviour-Smith from Massey University says that many psychologists and sociologists around the world are expressing anxiety over the isolation of our digital age.

He points to the work of Sherry Turkle, a Massachusetts Institute of Technology sociologist and psychologist. "[She] suggests connectivity makes us lonely, and technology is providing us with a false dream of forever being in touch, of always being heard."

Technology, it seems, can be a double-edged sword. But there's no denying it will play an important role in forthcoming decades. Our use of technology for leisure will continue to grow and develop. But how will this affect our relationship with the "real" world? What will our future leisure time look like?

According to Paviour-Smith, technology will enable us to experience "a seamless merging of digital and physical lives" in both work and leisure activities. But he says this doesn't have to be to the detriment of face-to face time.

Just as our future social life will be shaped by technology, so will our creative pursuits. Artists are already transcending the "real" to create exciting new visual worlds. But will technology mean the end of traditional art forms?

Curator and head of Whiti o Rehua School of Art at Massey University Heather Galbraith doesn't think so. She says that as culture becomes more "screen-based", interaction with physical art works will become more popular. "Galleries and museums will surely evolve to accommodate the changing realities of people's lives, [but] they will continue to be social spaces, where encounters with art are catalysts for conversations, hanging out and meeting up," she explains.

While the digital is likely to play an increasing role in the creation of art, Galbraith still sees traditional materials as being important. "While David Hockney is making iPad drawings, paint on canvas, panel or paper [will remain relevant]."

Our engagement with books is also set to change. As e-books and online publishing develop, new technologies will arise that make reading digitally more appealing. But according to Sam Elworthy, president of the Publishers Association of NZ, paper books will still have a role to play.

"Paper books fulfil many functions that Kindle and other e-books don't – they can be given as gifts, there is a perception that they are more robust, they look good on shelves. I think the cheap, hardy paperback will continue to be popular."

Interaction and experience are also key components of sport. But sport may be an experience that fewer of us are able

PARADOXICALLY,
THIS GROWTH IN
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to afford in the future. Stephen Stannard, head of the school of sport and exercise at Massey University, says sport will be increasingly hard for lower socio-economic groups to access. "Only those with money have the leisure time to engage in sport. Sports clubs that don't have much money are really suffering, as people who were previously happy to volunteer their time to coach now often want to be paid for their services. This will increase in the future."

While religion may not traditionally be seen as a leisure activity, Peter Lineham, professor of history at Massey University, says that it can now be seen in that light. He says that churches will play a multidimensional role in our future lives.

"Successful modern religious organisations utilise extremely slick marketing techniques and really understand the market," he says. "A good example of this is Parachute Music Festival; it's now the most successful music event in New Zealand."

Lineham also points to the "emerging church" movement as an example of the future of religion. "Groups in this movement are eclectic – they may focus on candlelight services meditation, they may be Christian or non-Christian – and are often transient." These grassroots churches are often not affiliated with any denomination; people



often meet in houses and engage in interfaith dialogue.

Whatever the future of our leisure time, Paviour-Smith believes that we will continue to actively engage outside of the digital sphere. "Most people will want their digital lives to reflect elements of their real life – the desire to share the physical world with those who are not present will continue to drive people's continued participation in social media.

"Yes, people use the internet to form relationships of all kinds – romance, gaming and other interests but they will pursue most of those in the real world too."

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The revitalisation of Queen St will continue, with light rail and the long-discussed option of making parts of it a pedestrian mall still a possibility.

he Auckland City of the future is no Blade Runner fantasy, says Auckland Council's urban design guru Ludo Campbell-Reid. It's not all gleaming glass towers and sky-high elevators; technology and vertical living.

"That's an unimaginable city, it's an horrific city where people are part of the machinery," he says. "I like a bit of chaos. Chaos is more exciting. People like intimate spaces. People like to walk. People want to see the church at the end of the road they are walking along. They want to see the city around them. They want the city to be about them. That *Blade Runner* type of modern city scares me."

What is planned for Auckland over the next two to three decades is more *Back to the Future* than *Brave New World*, he says. A place where pedestrians and public transport rule. Where alleys and open spaces take precedence over cars. An interlinking set of walkways lined with shops and restaurants, joining old and new city parks, creating people spaces above our motorway junctions and evolving a Kiwi urban lifestyle where residents can see the beautiful buildings and distinctive surroundings that give Auckland its character.

Difficult to imagine? The beginnings of this Auckland City of the future is around us now. Take the shared pedestrian/car spaces of Fort Lane and Elliott St. The family-centred parks and promenades of Wynyard Quarter, the rebuilt Auckland Art Gallery, Britomart and Te Wero bridge with its steps enticing children to dangle their toes into the Waitemata Harbour. Auckland City has been undergoing a transformation over the past seven years. Expect to see more of the

Victoria St Linear Park, above, will be Auckland Clty's urban green link, allowing Victoria and Albert Parks to merge

same over the coming decades.

Professor Paul Spoonley of Massey University says for another million people to be added to the city in the next 30 years, growth would equal that of 2001-2006, when the population gained more than 30,000 new residents each year. That does not seem out of the question, but there are aspects to that growth that will increasingly mark Auckland out as very different to the rest of the country.

"More New Zealanders will be Aucklanders," says Spoonley. "Even modest growth will see Aucklanders grow to about 38 per cent of the country's population in little over a decade, which will be unusually high in the OECD."

Meanwhile, many other New Zealand regions may decline in numbers as their population ages. Says Spoonley: "Auckland will grow while most regions will not. The size of Auckland, plus the fact it has growing population numbers, makes it attractive for those firms that require a steady labour supply and skills. So regions will struggle to keep jobseekers, firms and families in competition with Auckland."

The second factor is diversity. In 2010, Auckland was one of the most immigrant-

FUTURE NEW ZEALAND - NOVEMBER 14, 2013

AUCKLAND 17



Quay St will change from a car-dominated road to an important meeting and greeting place and a world-class waterfront boulevard.



The development of the major arterial routes of Hobson (above) and Nelson Sts needs to have the look and feel of dignified urban streets that encourage pedestrians.

dependent cities in the OECD with about 40 per cent of its residents born overseas. "The result has been a two-nations effect," says Spoonley. "Auckland versus the rest."

It is the Asian communities which are changing the city. From single digit numbers in the 1990s, by 2021 they are expected to comprise up to 28 per cent of the region's people. "The high numbers of immigrants in certain suburbs or in particular business areas has transformed parts of the city giving it a newfound cosmopolitanism," says Spoonley. "Auckland really has become a reflection of its location, an Asia-Pacific city."

That ethnic diversity is not without its challenges, however. Immigrants find it difficult to get jobs appropriate to their education and experience and Spoonley questions whether New Zealand is making the most of their trade links to their homelands. "When will Asians be represented in local government in proportion to their population?" he asks.

Immigrant communities are often more enthusiastic about inner-city urban living but Campbell-Reid says the new style of intensive housing planned for Auckland should convert many more of us to its charms.

There are plans to transform the inner-city roads already housing whole communities into narrower traffic lanes with green spaces for children, such as Hobson St which is already home to 10,000 people. He would like to see a new downtown school, Quay St to become a tree-lined boulevard on the waterfront, with room for some cars and light rail heading up Queen St. He points to the Vinegar Lane project, currently underway in Ponsonby, as a game-changer for urban living. Built with a supermarket below, surrounded by individually-designed terraced homes and apartments with rooftop gardens, courtyards and offices, it is a village of its own all in the same block. "In many cities now the space above the 'big box' stores and supermarkets are filled with apartments. Those big retail stores need people in them, and we need space."

The money for the redevelopment of the inner city is coming, he estimates, on a 4:1 private, public funding mix. Auckland Council has \$750 million to \$1 billion earmarked for improving the city centre over the next decade.

There will be big changes too, he says, in suburban Auckland as the new higher density rules allow for more townhouses and apartments in the currently struggling town centres.

"The people who will be primarily building Auckland in the next 15-20 years will be the mums and dads," says Campbell-Reid. "There are a very few big companies building hundreds of homes but there are thousands of individuals building the majority of Auckland. It's the back of the garden being subdivided, two units added on. Eighty per cent of Auckland is built by non architects." Resource consent can play a part in how that design is managed, he says, but a desire for, and acceptance of, better design standards is also needed.

"Scene 1, 2, and 3 would never happen on my watch," he says of the towering tiny apartments which block much of the city from the waterfront.

His big prediction for the next 30 years? Once the City Rail Link is up and running, a high-speed train linking Wellington to Britomart in a 2.5 hour trip, with Hamilton and Tauranga just an hour away also.

"That's when a city has two to three million people potential," he says. "We live in such a beautiful place, so many people want to come here, we're going to have to intensify to accommodate them all."



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FUTURE GENERATIONS NEED MORE INCENTIVES TO STAY

Liam Dann, NZ Herald business editor

On Twitter: @liamdann



ow will we create the jobs our children will want to do in the future? That's a question that should be central to all the economic choices we make today.

Short-term economic thinking puts New Zealand at serious risk of "Pied Piper" syndrome – our best and brightest youngsters will head for the hills, or more likely Australia.

But projecting 20 or 30 years ahead forces us to think about the next generation and it puts a human focus on questions about how we want our economy to look, what sort of infrastructure we want to build and the kind of lives we want to be living.

This country is heading into another cyclical boom

 we're not going broke – but we have structural issues that none of the major political parties have been brave enough to address. We are pricing our children out of the housing market in our biggest cities

and wages aren't keeping up. Even as the economy bounces back we see big corporations downsizing and shifting operations offshore.

If we're going to keep the next generation here we need vibrant cities with opportunities for careers in IT, design, finance and marketing. We need companies with head offices here.

That might not mean protecting all jobs at all costs. We have lost plenty of low-skilled manufacturing jobs in the past three decades. We may lose even more if our dollar stays high.

The solution is to create more than we lose and to educate our population with the skills we need.

Even though they will continue

to underpin our export earnings, it won't be enough to rely on agriculture and tourism if we want to really develop our economy.

The trouble is we just aren't that good at thinking long-term. Our politicians tend to think in three-year terms – six if they're feeling optimistic. Many of our biggest companies are struggling to look beyond the next annual result.

It is easy to lay the blame at the feet of company bosses or politicians but it is investors and voters that drive this culture. In other words: us.

Our Asian competitors seldom do anything without a long-term strategy. It helps to have a single party central government of course.

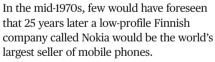
But we are a very small nation and a little bit of bipartisan consensus would go a long way.

With clear thinking and big vision we need to find a few big goals to agree upon – then we need to get on with it.

POTENTIAL TO EXCEL ON THE WORLD STAGE

Franceska Banga, Chief Executive of the NZ Venture Investment Fund

Icebreaker



A quarter of a century on, it could be New Zealand innovation leading the world.

It's not too farfetched. In 25 years, electrical cords could be a past relic as the world uses PowerbyProxi's wireless power transmission technology. Or a small industrial membrane system invented by Hydroxsys may have cleaned up global agriculture and mining operations.

While we are seeing some impressive activity in the technology sphere, where will major growth and innovation come from?

The game-changers will come about through innovating across different sectors, making the most of our population's diversity, and forging high quality international trade and investment relationships. We led the world with our China free trade agreement, and now with Taiwan. Over the next 25 years, we must continue to forge these relationships, not just in the trade context, but also the investment partnerships we form.

We need to be more flexible with offshore ownership – better owning 10 per cent of something huge, than 100 per cent of nothing. Partnering with international investors retains an ownership stake here, helps create jobs, and enables us to benefit from the wealth created (even more so if our superannuation and KiwiSaver funds are involved).

Innovating across sectors is where the biggest gains can be achieved. Icebreaker does this very well, combining a primary sector resource – merino – with textile and brand innovation. Christchurch company K9 combines primary products with value-add

processes to create a high quality natural pet nutrition brand. It is about brand creation, and developing highly differentiated highend products.

Cultural stereotyping is still a barrier to many Asian migrants who could become major contributors to the success of our businesses operating in the Asian market.

New Zealand is in danger of becoming a retirement village for the wealthy, unless we change our wealthy migrant policies. If the rules required that 10 per cent of wealthy migrants' investments have to be into growth companies via venture capital and private equity funds, this would bring \$25-\$30 million a year into the sort of growth companies which could make a real difference. Let's focus on attracting wealthy and entrepreneurial migrants who are willing to invest in and grow world-leading businesses from New Zealand.

BOOSTING VALUE OF EXPORTS KEY TO GROWIH

Increasing the worth of the goods we send offshore is a crucial way of improving New Zealand's prosperity. **Christopher Adams** reports

ew Kiwi commentators could more eloquently describe the importance of transforming New Zealand's economy – and boosting the value of its exports – than the late Sir Paul Callaghan.

In his 2009 book, *Wool to Weta*, the physicist highlighted one of the more heart-rending effects of this country's relatively low level of per capita gross domestic product (GDP), which has fallen well behind Australia's over the past 40 years.

"Our children go to London or Sydney or New York, and they like the lifestyle, they like the high salaries and they have plenty of Kiwi mates on hand," wrote Callaghan, who died last year from cancer. "There are plenty of countries on the planet less prosperous than our own. But when our grandchildren are growing up on the other side of the world, when we have to Skype to read a bedtime story, we feel a pang of grief."

Increasing the value of the goods we send offshore is a critical component of boosting the nation's prosperity and the Government has set a goal of lifting exports to 40 per cent of GDP by 2025.

It's a bullish target and victory is far from within our sights.

In the 12 months to March 2013, New Zealand's total exports – at \$46.2 billion – accounted for 31.4 per cent of the country's \$147 billion real (inflation adjusted) GDP, according to Statistics NZ.

In the same period of 2008/2009, when the National Party came to power, the proportion of exports was almost exactly the same.

Massey University professor of innovation and economics, Christoph Schumacher, says the 40 per cent goal is ambitious, particularly given the short timeframe that's been set.

"But it's feasible if the right changes are

made," he adds. "I don't think we can just go on with business as usual and hope we will get there."

He says New Zealand won't hit the target through only increasing its primary exports – commodities such as milk powder and logs – or simply growing the tourism sector.

"If we want to increase our export revenue we need to provide more innovative products," Schumacher says. "At the moment New Zealand focuses very heavily

1 Professor David Deakins 2 Theo Spierings 3 Christoph Schumacher 4 Mike Daniell 5 Andy Hamilton 6 John Penno 7 Sir Paul Callaghan

on the agricultural sector, but we are too often providing the raw product and shipping it offshore, where other companies make things out of it. I think there's a big opportunity to be involved in more stages of the value chain."

A government-commissioned report by market research firm Coriolis says highvalue, processed food accounted for only 14 per cent of New Zealand's total food and beverage export value in 2009. By comparison, processed food made up about 30 per cent of Denmark's and almost 40 per cent of Ireland's in the same year.

According to the research, New Zealand's "export mix" to Australia is more heavily weighted towards processed foods.

"Conceptually, if we could get our global food export mix to resemble our Australian food export mix, our food industry would be more value-added and profitable," the report says.

Achieving the shift towards higher value exports – which has been a topic of countless conferences, government reports and newspaper columns over the past couple of decades – remains a distant goal.

New Zealand exported \$45.5 billion of goods in the 12 months to the end of August this year, 44 per cent of which were dairy commodities (mostly milk powder), logs and meat.

Andy Hamilton, chief executive of Auckland business incubator The Icehouse, says reaching the 40 per cent of GDP target will require boosting primary exports in tandem with other, higher-value products such as technology.

"I don't support 'let's forget agriculture', because the whole economy is based on it," he says.

But while Kiwi technology stars like accounting software provider Xero are forging new paths for New Zealand's export growth, Hamilton says many opportunities remain in the food and beverage sector.

"If we just get a whole lot more of our food and beverage companies growing into Australia and succeeding, that would have a massive impact," he says.

Pat English, executive director of the New Zealand China Council, says the Chinese market will play a huge role in this country's export growth.

"Of the \$10 billion increase in exports we've had in the last five or six years, \$6.1



billion of that has been to China," he says. Indeed, New Zealand's exports to the Asian mega economy have tripled to \$7.9

billion since the two countries signed a free trade agreement in October 2008.

Marco Marinkovich, founder of Auckland's KiwiMilk Nutrition, says the booming Chinese infant formula market - estimated to be worth US\$12.4 billion and expected to double by 2017 - offers this country a lucrative opportunity to add value to its primary dairy products.

There's also talk of China, population 1.35 billion, relaxing its one-child policy, which could unleash a baby boom of almost unimaginable proportions.

"But the thing is, we're not going to get there if we continue to screw it up," Marinkovich says, referring to the recent

IF WE WANT TO INCREASE OUR EXPORT REVENUE WE NEED TO PROVIDE MORE INNOVATIVE PRODUCTS, CHRISTOPH SCHUMACHER

debacles in this country's trade relationship with China, including January's dicyandiamide (DCD) scare and Fonterra's spectacular botulism false alarm.

Small-scale New Zealand infant formula firms, whose exports had soared in recent years, have been losing up to \$2 million of weekly sales in China as a result of the ongoing impact of the botulism scare, according to the NZ Infant Formula Exporters Association.

While China promises to be a major component of our future export success, Schumacher says we shouldn't lose focus on other emerging markets - such as Latin America and smaller Asian economies.

John Penno, chief executive of Canterbury dairy processor Synlait, which is 39 per cent owned by Chinese dairy giant Bright Dairy, says his firm is being careful

not to become too "China-centric".

"At this point in history it would be easy for us to do that," Penno said in his presentation at October's China Business Summit in Auckland. "Our primary marketing strategy is a third [of exports] to China, a third to the rest of Asia and a third to the rest of the world."

German-born Schumacher says New Zealand could learn a thing or two from his homeland. Germany spends a lot more on research and development than New Zealand and the links between German universities and industry are much stronger than those in this country.

New Zealand's R&D spending, particularly from the private sector, lags behind other small, advanced economies.

Businesses in this country spent \$1.2 billion on R&D in 2012, or roughly 0.8 per cent of GDP, according to Statistics NZ.

Finland and Denmark's private sectors spend more than 2 per cent while Israel's companies spend over 3 per cent.

Schumacher says firms such as Warkworth's Core Builders Composites, which built Oracle's America's Cup-winning catamaran, are examples of the opportunities that exist for this country in high-tech boatbuilding.

Globally successful Fisher & Paykel Healthcare - which spent \$45.7 million, or 8.2 per cent of its operating revenue, on R&D in its last financial year - has also shown that New Zealand can lead the way in certain areas of medical technology, he adds.

However, less than 20 per cent of local companies are currently earning revenue in overseas markets, according to a report by Massey University's Centre for Small and Medium Enterprise Research.

The centre recently completed a study of how and why New Zealand companies "internationalise".

David Deakins, the centre's director,

TOP FIVE

Industries for growth

Dairy: Huge scope for growth in Asia, particularly China. Two-thirds of the global middle class expected to be located in Asia Pacific by 2030, while the Chinese middle class is predicted to reach one billion by the same year.

Marine/boatbuilding: Aiming to double technology and equipment exports to \$1.3 billion by 2020.

Software/cloud computing: Companies such as accounting software provider Xero and medical records firm Orion Health well on their way to becoming global players.

Clean technology/ biotechnology: Companies like biofuels developer LanzaTech and cancer diagnosis provider Pacific Edge showing positive signs that they could become the country's first biotech "big wins".

Food and Beverage: Opportunities exist for adding value to primary dairy ingredients with products such as infant formula and adult nutritional goods.

says the research found some common factors among the firms that had experienced export success.

"There really is a major commitment needed, so to sustain export activity you have to take a long-term view and commit enough time and resources into the overseas market," he says.

And the New Zealand dollar, which was trading at more than US82c last month, remains an ongoing impediment to the export sector.

ExportNZ executive director Catherine Beard says some companies are learning to deal with the strong currency.

"The companies that are getting good growth are the ones that appreciate that they've got to be globally competitive and developing products with an X-factor where they're not competing so much on price."

GROW AGRIBUSINESS, GROW NEW ZEALAND

Fran O'Sullivan, NZ Herald business columnist

iwi agribusiness leader Sir Graeme Harrison first coined the arresting phrase – "Agriculture: New Zealand's Silicon Valley". It's a visionary statement signalling the very real wealth that will accrue to New Zealand if we develop a more sophisticated agriculture sector to create high-end food products for the world's growing middle-classes.

The Government has set a goal to double primary exports by 2025 to spur economic growth and, despite the growth in other sectors, agribusiness will hold sway for some years yet.

Right now China is NZ's biggest agricultural export market, where dairy exports have trebled since the 2008 free trade deal. Fonterra is now investing \$1 billion in a series of farm hubs in China and stepping up the rollout of its own branded products including premium priced infant formula. The beef trade growth has been explosive and sheep exports have doubled.

It's not all been plain sailing as contamination scares, invoicing scandals and other issues have affected our major exporters. This is a pointer to the increasing professionalism our primary exporters must adopted they expand beyond China into the exponding into the expand beyond China into the expand beyond China into the expanding they expand beyond China into the expanding they expand they expan

our primary exporters must adopt as they expand beyond China into other fastgrowing markets in Asia and Latin America.

Market diversification is also essential. China's consolidation of its own dairy industry to create some new national champions is already creating new competitive pressures on Fonterra.

Other potentially valuable Asian markets are tying increased access to their growing consumer bases to the stipulation that foreign companies should simultaneously invest in their domestic industries to upskill their people.

Work is already underway on three growth kickers:

· The Government has launched the

nzherald.co.nz
Read Fran O'Sullivan's
full article at
http://tiny.cc/
futurenz

Primary Growth Partnership scheme to lift the value-add component of NZ agribusiness.

- Maori will spur growth as they increasingly leverage their own \$37 billion asset base.
- Investment in water via a range of irrigation projects essential to lift farm productivity was boosted by an allocation in this year's budget.

But there are also pressures. The intensification of the dairy industry has brought a wide range of environmental problems to the fore and there are also constraints on capital and supply chain issues.

Our farmers are ageing and there needs to be a great deal of work done to open the way to farm ownership to younger people. This is where foreign ownership of farmland comes in.

It's a balancing act. But exploiting NZ's agricultural DNA to the full holds a lot of promise for this small country.

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The way we farm must change to cater for predicted rapid population growth, says **Professor Danny Donaghy**

f the world's population is set to reach 8 billion by 2030, feeding everyone will require new approaches and agricultural systems. Achieving this in a sustainable way is the key issue facing farmers.

More intensive agricultural practices always have an impact, whether it's additional nutrient run-off or added pressure on water resources. How best to balance environmental concerns with the increased agricultural production needed to drive New Zealand's economy will be a source of debate for generations to come.

There are a number of trends currently pushing farmers to change their land management practices.

At the forefront is climate change. Last summer's drought really highlighted the extent to which we rely on its natural resources for economic prosperity.

Extreme weather events are no longer once-in-a-lifetime experiences; they are the new normal, and we need to build agricultural systems to reflect that. Surviving, let alone prospering, in this volatile environment will take systems that have harnessed technology, science and know-how.

The other key factor is public opinion. Kiwis love the outdoors, and quite rightly demand clean waterways and unpolluted countryside. As do our tourists.

"Green" consumers are also becoming more demanding and, at the same time, national and local governments are regulating to ensure the success of agriculture does not come at the expense of the environment.

Farmers occasionally grumble about

new regulations and additional costs, but they acknowledge the importance of adopting sustainable systems for their own long-term viability. What's needed is a change in mind-set: we don't need to intensively farm every square metre of land. As productivity gains are achieved through on-farm innovation and research, the less productive or sensitive areas of a farm or catchment can be retired from production.

Rather than trying to convert all land to the most profitable farming system of



WHAT'S NEEDED IS A CHANGE IN MINDSET: WE DON'T NEED TO INTENSIVELY FARM EVERY SOUARE METRE OF LAND.

the day, industry leaders need to use technology such as geographic information systems, overlaid with data on water quality and soil type to position farms for the future. In this way farmers will get more out of their productive land, while other areas can be returned to native species.

This approach will need the support of government, regulators and industry. It requires incentives for farmers and an understanding from consumers that they are paying for a premium product produced under best practice conditions. This will require more of a collaborative partnership model between consumers and farmers than currently exists.

The dual demand for more food and higher quality food could lead to a divergence in farm systems. There is no doubt that many farms will increase in size – but with greater efficiency and a smaller footprint – to meet the demand for bulk products.

But there is also a move to smaller, niche farm systems with a focus on quality, unique, artisan products. Agricultural industries are working with universities and other research providers to develop functional foods that help maintain health and prevent disease.

In 2030 New Zealand, the area dedicated to agricultural production may not be much larger than it is today. Good management and technological developments should mean greater production yields from land put to appropriate use. Some areas will see a change in agricultural use – for example between pastoral industries, or from pastoral to horticulture; others will be retired from farming and returned to native bush under covenant agreements.

Meanwhile, agriculture is unlikely to encroach on the wilderness areas that draw tourists from around the world, simply because that land isn't viable for farming. In fact, New Zealand has little unused land suitable for additional agricultural activity. The biggest changes in land usage in the future will actually be caused by something else – increasing urbanisation due to our growing population.

Danny Donaghy is the Dairy NZ Professor of Dairy Production Systems with Massey University's Institute of Veterinary, Animal and Biomedical Sciences.

THE FUTURE OF **FOOD**

Professor Paul Moughan and Professor Harjinder Singh of the Riddet Institute

ood producers face a number of major issues in the coming decades that will require current production systems to be challenged and new sources of nutrition to be discovered. The planet is in an era of rapid population growth, with estimates that the global population

will reach nine billion by 2040. This is two billion more, or more than 28 per cent, than now.

Much of this growth is in Asia, where there

FUNCTIONAL FOODS

To ensure health, people need to eat the necessary micronutrients and minerals required for a balanced diet. But the diets of many people do not include the range and quality of food to meet these needs. To overcome this issue, food scientists are creating functional foods, where staple foods have healthful things added to them. These foods can provide health benefits to those looking to prevent the onset of lifestyle diseases such as diabetes, coronary heart disease, hypertension, osteoporosis and bowel cancer.

This is not a simple process as a food's taste, texture and mouth feel change with the additives. But Fonterra has had phenomenal success with its Anlene brand of fortified milk, which contains calcium, vitamin D, zinc and magnesium to support bone health. Similarly, beneficial compounds such as omega-3 fatty acids have been microencapsulated to allow them to be added to food without the fishy taste. Functional foods will increase in prevalence as the population ages and people seek to improve their health through their diet.

BIOFORTIFICATION

Adding healthy ingredients to foods is one thing, but choosing strains of plants that have

is also a growing middle-class, hungry for high quality protein. The consumption of animal protein per capita in Asia increased 225 per cent between 1961 and 2007. People in the developed world are living longer due to improved medical care, and this means new food products will be needed that can deliver protein and micronutrients that are easily digested, bioavailable and that taste

good. A mix of old and new foods and technologies will be needed to sate this hunger.

AGEING

As people get older they start to lose muscle mass and their taste buds, but key to long-term health is finding proteins that are easily digested and absorbed. Recently, the Riddet Institute has studied enzymatic breakdown of waste meat products to produce highly digestible liquid hydrolysates that have very high rates of protein utilisation. These can be consumed as high quality gourmet soups.

NOVEL PROTEIN SOURCES

As well increasing the efficiency of animal protein production on our farms, new sources of animal protein are being investigated — from rabbits, insects and from aquaculture. Protein sourced from the biofuel and vegetable industries algae and other plants are

oil industries, algae and other plants are either already in production or being studied for efficacy and ease of production. Products such as Quorn, a vegetarian meat substitute made from a fungus that is already on the market, will become more common. Distinguished Professor Paul Moughan and Professor Harjinder Singh are co-directors of the Riddet Institute, a national Centre of Research Excellence focusing on food structures and digestive physiology hosted by Massey University.

higher
levels of nutrients and
minerals is an alternative way to enrich food. In
the past, crops such as corn
and wheat have been chosen for
their superior yield, but increasingly they are
now being bred to have enhanced nutrient
contents. In the future we will increasingly be
looking to varieties of commercial species
that are already more nutritionally rich. These
may have been eliminated from production
over time because the yield was insufficient.
Other types of plants such as quinoa and
millet are also being looked at as alternatives

3D PRINTING

Fast food is not new — the ruins of Pompeii contain about 120 fast food takeaway restaurants. Is 3D printing technology creating the fast food of the future?

Nearly a dozen groups around the world are now printing foods. Most are doing it the simple way, depositing a ready-mixed food material on a plate layer by layer to build up a shape. These printers are not currently "printing food", but rather "printing with food". If you use chocolate paste it sets into a chocolate shape of your design. If you use three colours and flavours you

can create a frozen dessert of any shape you like with the flavours and colours woven through at will. Some groups have made food pastes from insect parts.

to what we commonly consume.

At this stage, the secret is not to emulate an existing food — you will always be second best.

A printed food has no name yet. But one day it will and we will all know it by that.

One day you will be able to buy a printer

for the kitchen along with cassettes of colour, flavour and nutrients from the supermarket. But the ultimate goal is to reconstitute food from base materials and, while this is still several steps away from being a reality,

the day may come when a 3D printer in your kitchen can create any meal you have a recipe for layer by layer, removing the need to ship food around the globe.

THE WORLD'S **SMART FOOD** CAPITAL

New Zealand is in a strong position to become an international hub for agricultural education, training and technology. Claire Massey reports



n 2050 the milk crisis of 2013 may well be remembered as a turning point in New Zealand's approach to agribusiness. With the benefit of almost 40 years' hindsight the event could become as important a milestone as the first shipment of frozen meat from New Zealand to Britain in 1882.

We will hopefully see it as a comingof-age year when we realised that New Zealand's core advantage in agribusiness was intellectual property, a year when we collectively decided to pursue the goal of making New Zealand the smart food capital of the world.

So, how will we get there? As the saying goes, "never waste a good crisis". Now the story of Fonterra's botulism scare is fading from the daily news bulletins, the real work must begin. Industry leaders, government and the country's science providers need to develop a blueprint for the future.

This process should engage the whole country in an open dialogue. This year's crisis spilled over into many other sectors - tourism being the prime example - and it highlighted the fact that every one of the approximately half a million New Zealand enterprises has a role to play in building the country's reputation.

The next step is to focus on the whole value chain. We have traditionally focused on industries (dairy, meat, wool) or sectors (pipfruit, seafood) but, to gain most value, we need to build strength in all components of the chain - traceability, resource management, processing, packaging, distribution, retailing, marketing, branding, exporting, policy, finance, technology, computing, management, research and development.

We must also look for smart business models. One of our core national values is independence, but the demands of the future will require us to partner with those who have skills or resources we lack in a process of open innovation.

The problems facing the world today (food supply, poverty, disease, climate change) are complex. They require integrated responses, and we need to harness all the resources (including tikanga Maori) available to us.

New Zealand also needs to build a seamless science system. We already have excellent science and education systems where individuals and groups are closely connected, but we can do better. Our goal must be to provide easy access for firms, with scientists working across institutional boundaries (in New Zealand and around

the world) and alongside industry as standard practice.

We have clear capability in producing food, we have a business infrastructure that is consistently rated as amongst the best in the world, and a highly educated farming community that has the capacity to integrate the newest technology into its farming operations.

This puts New Zealand in a strong position to export education, training and technology in agricultural production. There is no reason we should not become a leader in knowledge distribution, an international hub for agricultural know-how.

The reality is that this blueprint does not yet exist in any formal sense - but that doesn't mean it shouldn't be written. Wherever conversations about New Zealand's future occur, these same ideas are kicked around: How do we work better together? How do we ensure that our firms have access to the best science and the best infrastructure?

It is only by ensuring our firms do what they do best – be enterprising and take the best of New Zealand to the world - that we can secure our economic future as the world's smart food capital. Professor Claire Massey is Massey University's Director of Agrifood Business.



FUTURE NEW ZEALAND - NOVEMBER 14, 2013

IN PURSUIT OF HEALTHINESS



Health care – who gets it and who pays for it – will be one of the most pressing issues of the next few decades. **Professor Paul McDonald** says our environment – natural and built – will play a part

oday, one in eight Kiwis is over the age of 65. By 2030, that number will grow to one in four. Add to that Kiwis migrating from the country to the city at the rate of one per cent per year and it all adds up to profound effects on our future health needs.

As our population ages, we'll see more chronic conditions such as cancer, asthma and chronic obstructive pulmonary disease, diabetes, heart disease, depression, and dementia. Population growth, the destruction of natural bush and wetlands, and climate change will mean greater contact with animals. That increases the threat of zoonotic diseases like bird flu (conditions that pass from animal to humans).

At the same time, humans will continue to develop conditions more resistant to treatment by antibiotics. As we've seen recently with Sars and H1N1, there will be no sanctuary as infectious threats are rapidly transported around the world and across national borders.

Let's talk money, too. The deadly combination of rapid rises in chronic,

zoonotic, and antibiotic resistant diseases will cause health care costs to continue their upward spiral. History suggests that increased reliance on technology, medications, individualised clinical treatment, and narrow definitions of evidence-based health care will not be enough to stem the tide.

These are the very factors driving health care costs in the United States,

Canada, Germany and the UK to unprecedented levels. As these countries' recent experiences have shown, the net effect is that health care gobbles up the money and resources needed elsewhere to keep your population educated and housed, the environment protected and the economy booming.

New Zealand's future health needs mean less care and more costs to individuals, at the very time many of us will be developing chronically disabling conditions, particularly among those already poor, unemployed, socially marginalised or unable to access education.

How can we ensure our future is one where more people live happy, healthy and prosperous lives; where environments are valued, and resources and opportunities are more equitably shared? It will require considerable creativity, political determination, and public support to move away from unsustainable and expensive medically-driven paradigms.

Recent research suggests that biology and genetics do not have as much influence over health as once thought. Rather, our social, built, and natural environments, our political and economic choices, and investments (or disinvestments) in education,

early life experiences, and our social

support systems constantly interact in complex ways to profoundly impact our likelihood of being healthy, and our ability to access and benefit from restorative care. Health doesn't have to be

defined as a set of medical conditions that occasionally have social consequences. Rather, it should be framed as a set of social, economic, political, cultural and environmental choices that have profound consequences for our health and health care.

Professor Paul McDonald is the Pro Vice-Chancellor of Massey University's College of Health.



FUTURE NEW ZEALAND - NOVEMBER 14, 2013 HEALTH 27

GETTING OLDER AND WISER

Rather than worrying about the effects of our ageing population on society, we should be looking at the opportunities it could provide for individuals and the economy.

Professor Christine Stephens and Associate Professor Fiona Alpass report

ew Zealand's ageing population reflects the combined impact of lower fertility, increasing longevity, and baby-boomers and early Gen Xs moving into older age groups. Baby boomers begin turning 85 in 2031, doubling the number of that age in 2008 and predicted to double again by 2061.

Population ageing is often viewed through a negative lens but this increased life expectancy is one of the greatest achievements of the past century and provides considerable opportunities for individuals and society.

OLDER WORKERS

New Zealand has one of the fastest growing labour force participation rates for older workers in the world. By 2030 the percentage of those aged 65-plus remaining in the work force will increase to 26 per cent, up from 16 per cent in 2010. Despite the concern over the costs of social security due an ageing population, many will continue to contribute to the economy. This is occurring as our manufacturing economy based on manual jobs moves to a service economy, with fewer physical demands on the worker.

Already, older workers are over-represented in the service sector.

But as baby boomers retire, the labour supply will decline and so efforts to retain older workers to offset the potential loss of critical organisational knowledge and experience will intensify. Incentives will encourage longer workforce participation through maximising work and retirement flexibility, and providing conditions that support lifelong learning, irrespective of age.

The "silver economy" will be a driver of future economic growth as business taps into the growing baby boomer market, a healthier and wealthier group with new consumer preferences and patterns of consumption.

AGEISM

As New Zealand's demographic makeup changes, so will our attitudes and prejudices towards the elderly. As baby boomers head into their 60s and 70s and older people remain working in positions of power, are visibly successful, and have a stronger voice in society, attitudes will shift.

Sexuality is one way in which understandings of older people's lives are changing. The sexual activity of older people will continue to grow in visibility, and different sexual orientations will become apparent as growing numbers of older people are able to declare their preferences.

Politicians are already keenly aware of the growing older vote, hence the Government's reluctance to raise the retirement age.

HOUSING

There will be shifts in the ways that we live. Changes occurring in Europe and the US suggest a wider variety of options for older people's housing than just gated retirement homes and seaside houses. One of these developments is shared spaces – systems of attractive communal housing.

There are different models or arrangements in which individuals have private apartments with shared communal facilities and systems of shared meals or attached restaurants and bars. An important feature of these housing arrangements is that they are part of the wider community, rather than being separated and gated.

There will also be increasing emphasis on care at home, supported by the state.

HEALTH SERVICES

With a growing focus on prevention of disease and community care for those with disabilities, health care costs will diminish. Technology will also bring many benefits including sophisticated mobility aids which will allow independence for those whose eyesight, hearing and movement are compromised; robots for cleaning and dispensing care; and instant communications when help is needed.

Telehealth, or the delivery of healthrelated services and information via the phone or internet is already in wide use in Australia and being trialled in New Zealand.

It is predicted to become a major way in which health care is delivered as it improves clinical responses and health outcomes and reduces isolation.

INEQUALITIES

Unequal living standards is one important difference between groups of older people that will become more apparent as the population ages. The national superannuation presently supports reasonable standards of living for most people. In the future this level of basic support will be strained, those who pay rent and have no savings will be seriously disadvantaged, and we are likely to see new groups of older people in hardship.



HEALTH FUTURE NEW ZEALAND - NOVEMBER 14, 2013

BAD BUGS: SHOULD WE PANIC ABOUT PANDEMICS?

It's becoming increasingly difficult to battle the bugs that make us sick as highly contagious pathogens evolve more quickly, and it is partly our fault, writes Professor Nigel French

here is an arms race occurring one that is largely hidden, but one that is vital for us to win. It is the battle between humans and the bugs that make us sick.

In recent years we have seen the emergence of a growing number of zoonoses - infectious diseases that can move between animals and humans – and other highly contagious pathogens. These pathogens are evolving more quickly than ever - in fact we are forcing them to develop.

Anti-bacterial and anti-viral drugs are driving the evolution of new, resistant strains. Urbanisation, global trade and travel, climate change and farming practices mean pathogens spread more easily and have a greater geographical range.

Historically, we have been able to keep pace with these developments. We are smart enough to develop new technologies: we have discovered new antibiotics, developed vaccines, found new surveillance tools that enable us to get ahead of the epidemic curve and put measures in place to prevent widespread infection occurring. But it is becoming increasingly difficult.

How concerned should we be about a serious pandemic? During the 20th century there were two major pandemics: the Spanish Flu of 1918 and HIV/ AIDS in the 1980s. The world could experience similar But what about the outbreaks in the 21st century. good bugs? How

How well we respond save us. http://tiny.cc/ will depend on a number of factors. If a new virulent strain of influenza was to develop during the Southern Hemisphere winter, New Zealand could be one of the first countries exposed.

The Southern Hemisphere Influenza Vaccine Effectiveness Research and

Surveillance project, a five-year Kiwi study funded by the US Center for Disease Control and Prevention, has just completed its second winter of surveillance and will be instrumental in improving the methods used for managing influenza outbreaks globally in the future.

New tools are helping us find out more about pathogen evolution. We have begun the process of sequencing the

bacteria might

futurenz

full genomes of large numbers of pathogens to discover patterns of change that happen throughout an epidemic. This gives us an insight into how pathogens spread and means we can identify the source of infection faster. But even with all the improve-

ments in vaccines, anti-virals and surveillance methods of the past 100 years, our population growth since the Spanish Flu outbreak means it is still possible a pandemic influenza would overwhelm our

medical system. A 2006 Treasury document predicted 40 per cent

of the population would

Clockwise from top left.

chamber as a precaution against the Spanish Flu. 1918: Eve van

their turn at the inhalation

Grafhorst, above on bike in 1986,

have become a common way to fight off

infectious diseases in the 21st century

was the first child in New Zealand registered as having Aids; facemasks

become infected, with a fatality rate of two per cent. The situation will be even more serious if the disease is something entirely new, as the HIV/AIDS virus was, and scientists have to go through the process of pathogen discovery to produce a vaccine.

To truly understand how pathogens move we need to break down the barriers between human and animal health. This brings together medical and veterinary expertise to address transmission cycles that involve both people and animals.

Staying ahead of pathogens as they evolve is vital for our health, our food and our economy - if our technology can't keep ahead of our own demographic changes we will be in serious trouble.

Professor Nigel French is the director of the Infectious Disease Research Centre at Massey University.





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30 GADGETS FUTURE NEW ZEALAND - NOVEMBER 14, 2013

FINDING THE FOUNTAIN OF **YOUTH**

Dr Austin Ganley

pill that will make humans live for longer may sound like the mythical Fountain of Youth, but it could be developed in the next 30 years.

Creating an anti-ageing pill requires a target that the pill will modify, usually a gene or genetic pathway. There is now overwhelming evidence for a strong genetic basis to ageing. On the one hand this isn't too surprising; longevity is known to run in families. On the other hand, isn't ageing just a gradual, random deterioration? This notion was thrown out by studies showing that mutations in just a single gene can dramatically increase the lifespan of simple organisms like nematode worms.

I've taken the approach of looking for ageing genes in simple organisms and then checking to see if humans have a similar genetic pathway working in the same way.



We believe ageing works more or less in the same way in a wide range of species because it is universal, so the core ageing genes are likely to be universal as well. But therein lies the trick: the Holy Grail of ageing research is finding these universal ageing genes, rather than the ones specific to each species.

The bigger question is whether living longer is really what we want. In an overpopulated, ageing future society, the focus must be on living better, rather than living longer. What we really want is a pill that increases the years of healthy living.

Recent research shows that in several species ageing treatments can improve healthspan more than lifespan.

The aim is to find a genetic pathway of ageing in humans that pharmaceuticals can target to reduce the impact of ageing.

Ageing research is making rapid progress, and in the short term we face a tension between individual interests and societal interests. Shifting the focus to improving healthspan, rather than lifespan is essential. In the long term the issues get more complex, and we must understand what we are trading off for a longer life.

After all, there's another kind of immortal cell that you will have heard of. Cancer. And that's the kind of unpredictable outcome no one wants.

Dr Austen Ganley is a senior lecturer with Massey University's Institute of Natural and Mathematical Sciences. His current research focuses on the role of rDNA genes in the ageing process.

WEARABLE ROBOTS KEEP ELDERLY **MOVING**

Frazer Noble

Providing ways for the elderly to live independently for longer will be one of the key social issues New Zealand faces in the future. While social services need to be revolutionised, technology – including robotics – will also have a role to play.

A robotic exoskeleton that helps a frail or disabled person lift things or walk around sounds pretty futuristic. But these things already exist – it's just a matter of the technology becoming more affordable and readily available.

New Zealand's Rex Bionics and Japanese manufacturer Cyberdyne are just two examples of firms already in this market. Rex Bionics' robotic legs allow wheelchair-bound users to sit, stand, walk and turn with relative ease. The system is controlled via a joystick and used mainly by sufferers of degenerative diseases, such as Multiple Sclerosis, or spinal injuries.

Even more impressive is Cyberdyne's Hybrid Assistive Limb (HAL), an exoskeleton suit jointly developed with Japan's Tsukuba University. The suit is designed to assist elderly people with daily tasks, including walking, although it can also help the able-bodied to lift heavier loads. HAL registers biosignals on the surface of the wearer's skin to amplify their movements and is already used in rehabilitation in Japanese hospitals and nursing

Improvements in robot technology will help with the care of our ageing population.

homes.

Robotic nurses are another popular approach. In Japan the use of robots in hospitals is growing all the time. It's not hard to imagine a time when the elderly or disabled will be able to travel around without the need for walking frame or wheelchair. The next-generation powered exoskeletons will no doubt be more streamlined, responsive and cost-effective to produce. Frazer Noble is a lecturer

with Massey University's School of Engineering & Advanced Technology. FUTURE NEW ZEALAND - NOVEMBER 14, 2013 GADGETS 31

THE RIGHT DEVICE

If there's one thing futurists agree on about what's coming in the next few decades gadget-wise, it's that the line between objects and bodies will blur. **Peter Griffin** highlights some futuristic prototypes



MEDICINE ON A CHIP

The concept of embedding electronic medical devices in the body became a reality more than 50 years ago with the arrival of the heart pacemaker. The miniaturisation of computer components now means all sorts of medical sensors and devices are ready for the flesh. The Medical Implant Communications Service (MICS) frequency band is an embedded chip that acts as an antenna to beam info about the state of the body to doctors on the outside. As well as keeping tabs on blood pressure, circulation and metabolism, it will also work with neurostimulation devices. Expect to swallow one on a trip to the doctor circa 2030.

A NICE GESTURE

Scientists have been working on more natural and ergonomic ways to control gadgets for years, with Microsoft's Kinect motion camera and hand-waving controls built into the new wave of smart TVs finally taking the remote control out of the picture. But cameras can only detect so much. For subtle gestures you'll need the Myo, an armband that detects electrical activity in your muscles. Tap your little finger to lower your stereo's volume or point at the phone to answer it. The Myo will work wirelessly with all sorts of gadgets and will debut next year for \$150.



SPIN CYCLE

The Orbit will revolutionise washing machines using a "cryogenic cleaning system" to scrub your clothes. A sphere that holds your laundry levitates in a superconducting ring lined with liquid nitrogen-cooled electromagnets, spinning quickly as it is bombarded with jets of CO2 which blast the dirt off the clothes. It doesn't use powder or water, giving it serious green credentials.



Google Glass, the augmented reality glasses developed by the search engine giant, has been lauded as the new gadget of the year. But Korean scientists are close to making glass obsolete. The answer lies in graphene, an incredibly thin and flexible new nanotechnology. The Koreans have embedded a graphene-based, light-emitting diode into a standard contact lens, allowing images to be beamed directly onto the eye. Testing the lenses on rabbits shows no damage or irritation of the eyes, so it's full steam ahead developing them for humans. Eventually we could be slipping on contact lenses to augment our worldview with data feeds, to take photos and watch movies.



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