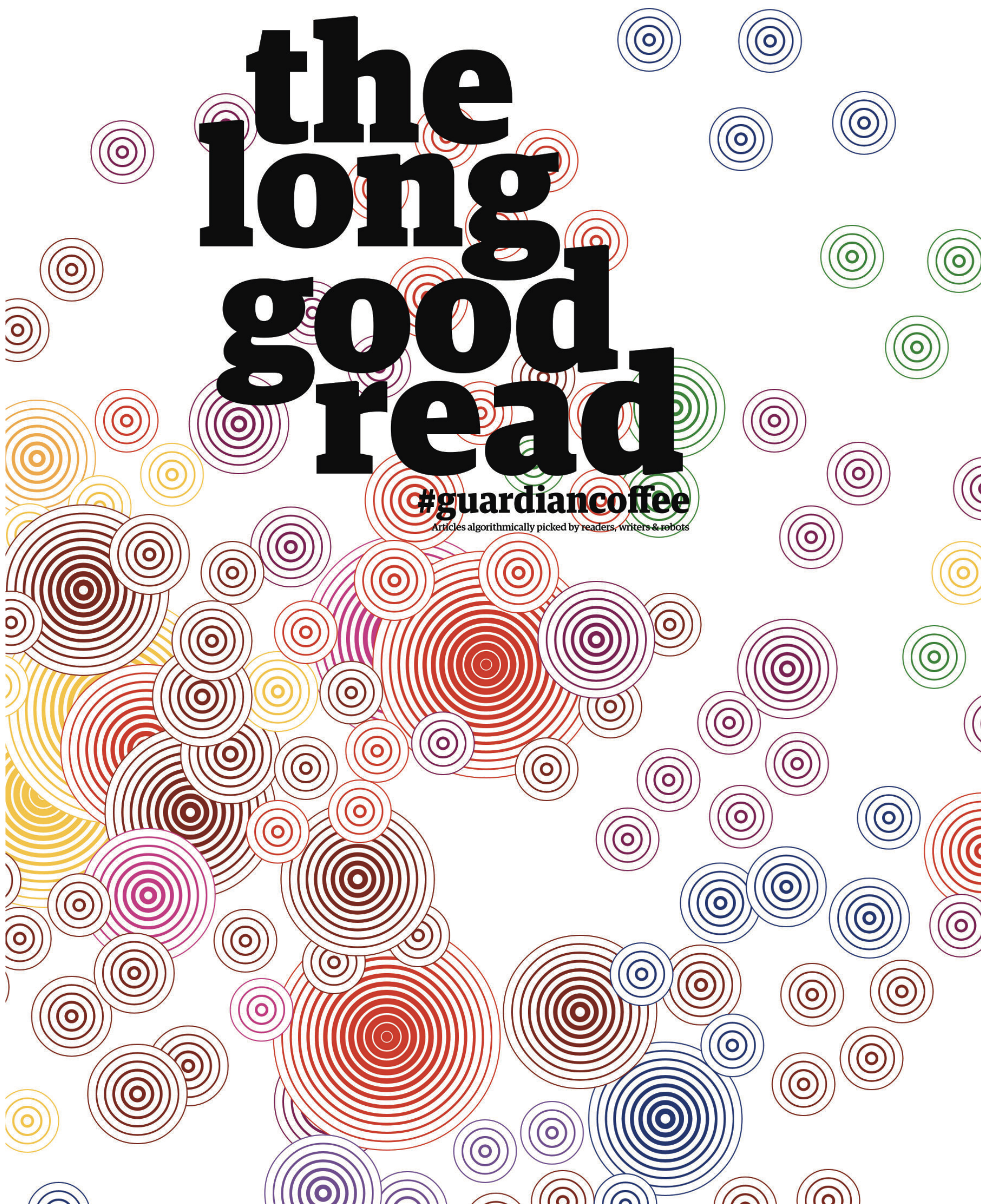


#009

the long good read

#guardiancoffee

Articles algorithmically picked by readers, writers & robots





Welcome to the Long Good Read. This is an experimental, almost entirely automated newspaper that uses an algorithm to pick the week's best long-form journalism from the Guardian. The idea was started by developer Dan Catt, print-your own newspaper service Newspaper Club, the design team at Mohawk and the technology editorial team at the Guardian. We've put this together for you to read with your coffee. Enjoy! And please do tell us what you think - what else should we include in our experimental, automatic newspaper?

**@thelonggoodread or
hello@thelonggoodread.com**

Spend time listening to anyone in the media industry, you might think newspapers are dead. In fact it's just pulse of the big media businesses around the newspapers that is growing weaker, with readership and advertising revenues falling and increased competition from new technology just a part of that.

But newspapers themselves are a delightful, tactile, luxurious technology in their own right. The success of Newspaper Club, which lets anyone cheaply print their own newspaper, shows that newspapers have been reclaimed in a way.

Its success is partly down to our curiosity about being able to professionally print in a format that used to be hard for an individual to access, but it is also part of a wider craving for tangible, physical products to compensate for our digital dependency. Our screen lives make much of our life feel overwhelming, yet at the same time we have nothing physical to show for it. And there's a real human pleasure in being able to make and hold something in your hands.

Editorially, we get enormous satisfaction in exploring and playing with new projects. It's not about finding a future for paper, but a future for the stories that deserve telling. Where shall we go next?

Jemima Kiss

Head of technology - editorial

The Guardian

theguardian.com/tech



This newspaper is in beta. It's an experiment in combining the Guardian's readers, writers and robots with Newspaper Club's short-run printing tools, to produce a newspaper that's completely unlike the daily Guardian.

We're only printing 500 copies, and it's just for #guardiancoffee, so it needed to be quick and easy to produce. 'One person, one hour' was the goal, and achieving that required automating as much as possible, while still retaining an editorial eye.

First, the team at the Guardian wrote a small tool to sift through the most popular and interesting long form content, as driven by website analytics, comments and social media.

A selection of these are then imported into Newspaper Club's browser based tool, ARTHR, and they're quickly laid out into templates designed just for this project.

Then, it's onto one of Newspaper Club's printing presses, where it's printed, packed, and delivered straight to #guardiancoffee and into your hands.

Of course, this isn't designed to replace the daily Guardian paper. It's an experiment to see what's possible at the other end of the spectrum, using new technology and techniques to produce a newspaper as quickly as a webpage.

And if you like it, wait a little while and maybe we'll be able to generate one tailored just for you.

Tom Taylor

Co-founder and head of engineering

Newspaper Club

newspaperclub.com/longgoodread



The twin cynomolgus monkeys, Ningning and Mingming, born at Nanjing Medical University in China. Photograph: Cell, Niu et al

Genetically modified monkeys created with cut-and-paste DNA

Breakthrough could help battle diseases such as Alzheimer's and Parkinson's but ethical concerns remain over animal testing

By Ian Sample, science correspondent

Researchers have created genetically modified monkeys with a revolutionary new procedure that enables scientists to cut and paste DNA in living organisms.

The macaques are the first primates to have their genetic makeup altered with the powerful technology which many scientists believe will lead to a new era of genetic medicine.

The feat was applauded by some researchers who said it would help them to recreate devastating human diseases in monkeys, such as Alzheimer's and Parkinson's. The ability to alter DNA with such precision is already being investigated as a way to make people resistant to HIV.

But the breakthrough is controversial, with groups opposed to animal testing warning that it could drive a rise in the use of monkeys in research.

One critic said that genetic engineering gave researchers "almost limitless power to create sick animals".

The work was carried out in a lab in China, where scientists said they had used a genome editing procedure, called Crispr/Cas9, to manipulate two genes in fertilised monkey eggs before transferring them to surrogate mothers.

Writing in the journal, *Cell*, the team from Nanjing Medical University reported the delivery of twin female long-tailed macaques, called Ningning and Mingming. Five surrogates miscarried and four more pregnancies are ongoing.

The Crispr procedure has been welcomed by geneticists in labs around the world because of its enormous potential. Unlike standard gene therapy, Crispr allows scientists to remove faulty genes from cells, or replace them with healthy ones. It can even correct single letter spelling mistakes in the DNA code.

The Chinese team, led by Jiahao Sha, said their work demonstrates how Crispr could be used to create monkeys that carry genetic faults that lead to diseases in humans. But the same could be done to small pieces of human organs grown in the lab, and used to test drugs, or to monitor the progress of serious diseases.

Nelson Freimer, director of the centre for neurobehavioural genetics at the University of California in Los Angeles, said that while researchers often use mice to study human diseases, brain disorders are particularly hard to recreate in the animals because their brains are so different.

"People have been looking for primate models for a whole list of diseases, but in the past it's been either completely unfeasible, or incredibly expensive. This is saying we can do this relatively inexpensively and quickly, and that is a major advance," said Freimer.

But Freimer added that the use of monkeys was likely to remain a last resort. "It's going to be really critical to define the problems for which this is used, just as you always do with animal research. You want to use all the alternatives before you propose animal research. This will be reserved for terrible diseases for which it offers hope that cannot be gotten any other way," he said.

Tipu Aziz, who has used primates in his work on Parkinson's disease at Oxford University, welcomed the new procedure. "If we can identify genes for neurological disorders in a clinical setting and transpose those into a monkey it would be of massive benefit. I don't know that it'll lead to a rise in the

use of monkeys, but it will lead to more focused studies," he said.

Robin Lovell-Badge, head of genetics at the MRC's National Institute for Medical Research in London, said that genetically modified monkeys could be valuable to check new therapies before they are tried in humans. "Mice are fantastic models for some aspects of human physiology, but they are not always perfect, and it's good to have alternatives," he said. "If you are trying to develop a stem cell therapy and want to graft cells back into the brain, it's difficult to know how it will work in a complex brain, and mice or rats are not suitable." With Crispr, scientists could perform far more subtle genetic tweaks than is possible with other methods, he added.

George Church, professor of genetics at Harvard University, has co-founded a company, Editas Medicine, that aims to use Crispr to treat a number of human diseases. While monkeys had a role to play, he said another approach was to grow human "organoids" or small clumps of human organ tissue in the lab, and use Crispr to give them genetic faults that cause disease. "This is a really big moment, because if you think something has a genetic component, you can prove it with Crispr, and then improve it with Crispr, or other therapies," he said.

One idea in trials already uses genome editing to remove a gene called CCR5 from human immune cells. Without the gene, the HIV virus cannot get into immune cells, so patients could be cured of the disease. In future, the same procedure could be used on healthy people at risk of the disease to make them resistant to infection.

Vicky Robinson, chief executive of National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs), said: "This research could drive an increase in the use of non-human primates worldwide. Whether that would be justified in terms of the benefits to scientific and medical research, let alone the ethical considerations, is open to debate. Just because the monkey has greater similarity to man than other animal species does not guarantee that it will be a better surrogate for studying human disease, a point that decision makers - funders and regulators - should take seriously."

Troy Seidle, director of research and toxicology at Humane Society International, called for an outright ban on the genetic manipulation of monkeys. "You can't genetically manipulate a highly sentient non-human primate without compromising its welfare, perhaps significantly. GM primates will be just as intelligent, just as sensitive to physical and psychological suffering as their non-GM counterparts, and our moral responsibility toward them is no less. In fact, the scope for animal suffering is increased because genetic engineering gives researchers almost limitless power to create sick animals with potentially devastating and disabling symptoms, which can include entirely unexpected phenotypic mutations. It's also worth noting that this research is being pioneered in China, where there are currently no laws or enforced ethical controls on animal experiments."

Dr Andrew Bennett, a scientist with the Fund for the Replacement of Animals in Medical Experiments (Frame), added: "Whilst the technological advances in genetic engineering are to be both applauded and admired, their subsequent use to produce genetically modified monkeys is questionable at best. Frame would call for more funding to be used to produce model systems based on human tissues and cells rather than try to develop more sophisticated laboratory animal species. If you're working on human disease, then it is necessary to use human-derived material to predict human responses."

Cities and their psychology: how neuroscience affects urban planning

The study of metropolitan areas and how their inhabitants interact with them is key to planning our future as a species

By Colin Ellard

More than 30 years ago, the pioneering urbanist William Whyte was charged by the city of New York with the task of unraveling the mysteries of public space. Why do some such spaces attract crowds of happy visitors whilst others sit barren and empty?

Whyte's research programme, conducted with stopwatches, time-lapse videography, and lots of simple paper charts, was a spectacular success. Based on his findings, he made a series of simple and easily implemented recommendations that the city soon codified into its municipal construction codes.

Today, any visitor to New York might find any number of things to complain about but the wide availability and attractive human affordances of the city's many public spaces is not likely to be among them. Whyte's epiphany was that the way to answer important questions about how to build a commodious and psychologically healthy city lay in careful observation, collection of data and the creative ability to lay aside preconceptions and view a streetscape with a "beginner mind".

Whyte's book *The Social Life of Small Urban Spaces*, and the short film based on this work, are as fresh and insightful now as the day that they appeared, and are required reading and viewing for any student of urban behaviour.

Fast forward a few decades, and many things have changed, but the fundamentals remain the same. If we want to know how to make a better city, the place to start is at ground level, using observation and measurement, and applying what is known of the human sciences to those measurements to build

a psychologically grounded view of the relationship between the physical design of a city and what happens there.

What has changed dramatically is the set of tools that are available to those who would understand the detailed workings of the urban realm. Now we can go well beyond simple observations of the overt behaviour of city dwellers. We can look inside the bodies and minds of those who inhabit urban spaces. We can measure their gaze, their beating hearts, and the state of their autonomic nervous systems as they react to arousing and stressful events.

We can also measure their brainwaves. We can, if we are willing to carry specially designed apps on our mobile phones, record our location and movements, but also our moods, interests, and our patterns of thought. New affordable devices for measurement of a host of brain and body variables are reaching the consumer marketplace every day, and many of them can be paired with phones.

There is even a recipe for a DIY brainwave headset that consumers can print for themselves with a 3D printer and use with openly available software. The wide availability of sensors that measure our physiology, powerful, mobile, computing platforms, and information networks that can connect us to research laboratories with interests in urban behaviour has vaulted the methodologies used by Whyte into a toolbox filled with unprecedented and exciting opportunities to harness huge amounts of psychological data to make sense of how a city works.

For a fully realised science of urban psychology though, it isn't enough to have a powerful array of methods for the collection of data. We also need theory and experiment. For a truly scientific ap-

proach to the problem of the city, we need to be able to test hypotheses, and compare alternative urban realities. But how can we do this when our subject matter consists of vast constructions of concrete, glass and metal? We can't tear down and rearrange city blocks to see what works. In tandem with our arsenal of tools for measurements, we need a way to build hypothetical city spaces. How do we develop an experimental science of urban design?

In the research laboratory for immersive virtual environments (Relive) at the University of Waterloo, we have turned to simulation methods to help build such a science. Participants are placed into highly immersive simulations of city spaces using sophisticated head-mounted displays and precise motion tracking. They are able to walk freely through photo-realistic simulations of urban spaces that are replete with depth, colour, and motion. We can monitor their gaze and their movements along with their physiology using a set of unobtrusive sensors while they do so. One of our environments is based on Shibuya, a hectic and seemingly chaotic part of Tokyo with its famous scramble crossing - one that allows pedestrians to cross from all directions.

The use of 3D visualisations by architects and planners is not particularly new - design professionals often use simulations to explore the look and feel of a construction. What is new is the capability and will to explore our reactions to such simulations at a fine-grained level of analysis using sophisticated methods of data collection and analysis. Using such methods, we can explore the behaviour of a visitor to a virtual urban setting whose design, because it is built only of pixels, is entirely under our control and can be arranged and rearranged with a few keystrokes on a computer.

For example, in one recent set of experiments,



Immersive virtual environments compilation. Photograph: University of Waterloo, Canada

conducted by Kevin Barton of Relive, we designed a stark-looking industrial setting consisting of about 30 city blocks. The streetscapes were so designed to explore the impact of different types of layouts on how we find our way and how the shape of an environment influences attention, cognitive effort, and urban stress. One layout was very orderly, like a Manhattan, Washington or Canberra, while another was more organic and meandering, like New Orleans or London. We discovered that the manner in which such cityscapes were explored, and the psychological reactions to their design, varied strongly with their overall "grammar".

Journeys through the systematic spaces were stereotyped and efficient and accompanied by low levels of arousal and attention. Journeys through the more chaotic spaces were longer, filled with more hesitations, arousal and effortful attention. The value of such findings is that they give us a set of powerful methods by which to predict the psychological effects of an urban design before anything is built.

Although there is no doubting the power of a virtual reality simulation to unearth relationships between the organisation of the built environment and the operation of our minds, we still need to establish that our simulations are close enough to the real thing that findings from our laboratory generalise to the lived-in environment of a city filled with a hubbub of people, noise, smells, and traffic. For this, there is no substitute for experimentation at street level. Our approach has been to lead participants on walks through city spaces while wearing gear that allows us to measure their cognitive and emotional responses to what they experience.

In one such study, conducted as a part of the travelling BMW-Guggenheim Laboratory, we were able

to show that views of green space not only caused people to become happier but also changed their physiology - their autonomic nervous systems showed strong signs of relaxation responses. Though such a finding provides good ammunition for those who advocate for the importance of refreshing oases of nature in dense cities, it was hardly a surprise to us. What is more interesting is that we can reproduce these effects in simulations in our laboratory, meaning that we are able to pinpoint exactly what aspects of natural views produce such restoration.

In one such study, conducted by Deltcho Valtchanov of Relive, we were able to produce physiological relaxation using views of virtual nature that was just as dramatic as that seen in visitors to real-world green spaces. In more recent work, we have shown that a part of the relaxation response to natural scenes hinges on specific properties of visual scenes that can be defined mathematically (the relative proportions of finely detailed contours as opposed to the more coarse "blobby" contours that are present in the image).

What is exciting about this finding is both that it makes a good match with what is known of the preferences of brain areas known to be involved in reward and environmental preference, and that it provides a tool with which to predict the restorative potential of an urban vista on the basis of its visual properties, regardless of whether it contains trees and grass. This might point the way to methods that could optimise such effects in crowded cities where the space available for parkland is severely limited.

The examples I have described suggest that a marriage of laboratory-based virtual reality simulations with real-world observations using smartphones and physiological sensors could form the basis of a

new and powerful discipline of experimental urban design based on sound principles of psychology and neuroscience. As we move into an exciting new era of city design in which engaged citizens have never been more interested in how to make cities better, and in which they can be provided with good tools to contribute to the efforts to do so, we are poised to move into high gear.

We have ambitious plans to move beyond these initial steps to build more comprehensive models of both existing and hypothetical city spaces in our lab, and to provide more tools to determine how to grow great cities. As we face an era of daunting problems including population growth, changing energy balances, urban densification, and climate change, the need for solutions has never been more pressing. But on the positive side, our approach provides a strong window of opportunity to entertain and implement important changes.

Colin Ellard is an experimental psychologist at the University of Waterloo, Canada



Celestial space ... A scene from *Atomos* by Wayne McGregor and Random Dance at Sadler's Wells in London from October 2013. Photograph: Tristram Kenton for the Guardian

Lighting designers used to be faceless backstage figures. Now the hottest choreographers can't work without them. Meet the new wave of trailblazers
By Judith Mackrell

Lucy Carter has strong feelings about the power and possibilities of light. "It affects everything," she says. "You can be feeling quite awful somewhere, and it's simply because the lighting is so terrible. It's very emotive." To make her point, Carter indicates the subtle changes of light taking place in and around the boxy little office at the Trinity Laban dance centre in London, where we are talking. "I'm wondering whether this is natural light coming through the window," she says, "or internal light. And why the grass outside looked so vibrantly green a while ago - but now looks sort of muddy."

As a lighting designer, Carter admits that she is constantly processing this kind of information. It all began when she was a dance student, and found herself becoming more interested in lighting pieces than choreographing them. And in the last 20 years, it's taken her to the forefront of a whole generation of designers who've taught dance audiences to see light in new ways. Carter, along with Michael Hulls, Guy Hoare and others, have made light do way more than simply make performers visible. They've made it a form of choreography in its own right.

Watching the work of Wayne McGregor, with whom Carter regularly collaborates, it's sometimes impossible to separate the movement from the light: the mysteriously glowing halos that enclosed the dancers in 2012's *Carbon Life*; or the pixelated colouring in 2013's *Atomos* that took its cast through smog and fire into suspended celestial space.

The same is true of Hulls's many collaborations with Russell Maliphant. In 2009's *AfterLight*, the spinning momentum of the solo dancer became al-

most indistinguishable from the spiralling pattern of light whirling around him - first concentrating, then diffusing, the dervish ferocity of his turns. It's far more than courtesy that makes Maliphant cite Hulls as a co-creator. As the designer explains: "People have always assumed that lighting can be like a layer, applied over the finished work - that the designer can be brought in at the last moment. But we begin from day one."

Maliphant and Hulls met in 1994, finding they shared an interest in "what a real collaboration between dance and light would look like, where each would totally affect what the other does". Fittingly, their most famous collaboration is called *Two*: a duet for dance and light in which the solo performer's body is both sculpted by light into something mysterious and dense, and then, by a reverse process, dissolved into radiance and air.

It's an astounding alchemy - yet it was discovered purely by accident, as the two men experimented on stage one day. Hulls was playing with the idea of having "two long strips of light just over a metre apart, like railroad tracks". They asked their guinea pig, dancer Dana Fouras, to perform a range of movements between the lines. One was a series of fast "chaine" turns with whipping arms, and the result, recalls Hull, "was something we'd never seen before". As Fouras moved between darkness and light, "her arms began flashing and creating this flaring effect. It was amazing."

For Carter and McGregor, the dialogue between light and choreography is no less involved, although it begins in a more abstract way. At the start of any new project, the two discuss the conceptual or narrative ideas McGregor has. Then Carter will go off on her own, developing lighting ideas that might evolve with the choreography. It helps that Carter has a clear idea of what McGregor needs, having lit

all but one of his productions. "Lucy refines and finesses lighting to such a degree," he says, "that it grows and changes with the choreography. If I make a cloud structure, she can give me some kind of cloudiness in the lights. In one section of *Atomos*, I made origami structures and Lucy produced this sense of folding light that was really beautiful."

Paradoxically, the evanescent poetics of light often depend on technology of blinding complexity. "I used to sketch everything out on paper," says Carter. "But now it's all done on computer. Even the lights have become intelligent. They can do more than one thing now. Some can even solve their own problems." She cites the LED lights she used recently that are capable of blending colour in response to video footage. She laughs and admits: "I wasn't at all good at maths and science at school." Still, she only engages with new technology when she must. "Only when I have an idea and don't know how to make it happen."

Hulls's instincts have remained more low-tech: he still prefers working things out with pencil and paper. But he will research new tools when required. With *AfterLight*, he couldn't get the effect he wanted from a conventional lighting rig, so, with the help of animator Jan Urbanowski, he created a swirl of digital patterned light that was projected over the dancer. "It was like seeing a cyclone on a weather satellite," he says. "The light was very textured and organic - it could move, dissolve and reform."

Such poetic innovations do, of course, take time - but sometimes time isn't available. When Carter made *Atomos* with McGregor, she had two weeks to experiment with the rig and dancers before the premiere. But McGregor is also resident choreographer of the Royal Ballet and, when they work together at the Opera House, time can be even tighter. *Tetractys: The Art of Fugue*, their new one-act ballet pre-

How lighting design and technology are transforming dance on stage

miering this week, is the result of three three-hour sessions on the stage.

"You tear your hair out," says Carter, "because you just have to throw stuff at the stage and see what sticks. You can't craft it or change it." But for all the frustrations she encounters, Carter is happy that she and her peers are gaining recognition. Once, lighting designers were rarely mentioned in reviews, and certainly never known to the public. In the 2010 Olivier awards, however, Hulls was nominated for outstanding contribution to dance, a category dominated by performers and choreographers. And the industry now has its own major awards: the Knights of Illumination, set up in 2008.

To leading designer Peter Mumford, who started out in 1969, it's nothing less than a sea change. "I really think dance has led the way in exploring and expanding what light can do on stage," he says. Hulls agrees. "Light enjoys a freedom in dance, especially non-narrative dance, that it can't have in opera or theatre." In fact, Hull believes dance and light enjoy a special kinship, thanks to their shared ability to dramatise space and convey nuances of emotion. "They're both so hard to talk about," he says, "so ephemeral. They don't exist except at the moment of performance. That's why I only work in dance. It's where light can reach its full potential."

Inside 'Billionaires Row': London's rotting, derelict mansions worth £350m

The North London street where billionaires can buy homes, never live in them, let them rot and still make millions

By Robert Booth

A third of the mansions on the most expensive stretch of London's "Billionaires Row" are standing empty, including several huge houses that have fallen into ruin after standing almost completely vacant for a quarter of a century.

A Guardian investigation has revealed there are an estimated £350m worth of vacant properties on the most prestigious stretch of The Bishops Avenue in north London, which last year was ranked as the second most expensive street in Britain.

One property owner, the developer Anil Varma, has complained that the address has become "one of the most expensive wastelands in the world". At least 120 bedrooms are empty in the vacant properties.

The empty buildings include a row of 10 mansions worth £73m which have stood largely unused since they were bought between 1989 and 1993, it is believed on behalf of members of the Saudi royal family.

Exclusive access to now derelict properties has revealed that their condition is so poor in some cases that water streams down ballroom walls, ferns grow out of floors strewn with rubble from collapsed ceilings, and pigeon and owl skeletons lie scattered across rotting carpets.

Yet, despite the properties falling into serious disrepair, it is likely that the Saudi owners of the portfolio made a significant profit from the £73m sale. The records available show that one of the mansions was worth only £1.125m in 1988.

The avenue, close to exclusive Highgate and Hampstead, is home to Richard Desmond, owner of Express Newspapers and Channel 5, members of the Saudi royal family, and Poju Zabłudowicz, a billion-

aire art collector and philanthropist.

Homes are on the market for up to £65m but there are also 16 unoccupied mansions. More still are only used by their owners for short periods each year.

Most of the properties in the most expensive part of the avenue are registered to companies in tax havens including the British Virgin Islands, Curaçao, the Bahamas, Panama, and the Channel Islands, allowing international owners to avoid paying stamp duty on the purchase and to remain anonymous.

The revelations come at the same time as a growing political row over how empty properties can help solve a national housing shortage growing by more than 100,000 homes a year.

Boris Johnson has defied Downing Street to call for taxes to be cranked up on owners of vacant properties. He told City investors this month: "London homes aren't ... just blocks of bullion in the sky." He called for owners to live in their homes or rent them out. But the government has resisted attempts by councils, backed by the mayor, to multiply council tax rates on homes left empty for two years.

The proportion of empty properties on the most prestigious stretch of The Bishops Avenue is 10 times higher than for the rest of England, which has 710,000 empty homes.

"This illustrates everything that is wrong with the London housing market," said David Ireland, chief executive of the Homes from Empty Homes campaign group. "The high values are being used as an extreme investment vehicle at the expense of homes being homes."

"London's shortage of homes is so great that this feels immoral and dysfunctional. There are countless people in inadequate housing and here are homes on The Bishops Avenue that could be used."

Unoccupied properties include a mansion seized following a high court judgment against a Kazakh

businessman accused of a \$6bn (£4.5bn) banking fraud and the repossessed home of the former Pakistani minister of privatisation, Waqar Ahmed Khan, where the windows have been sealed up with metal grilles.

Other houses show signs of limited habitation. The roof of one £10m home, registered in the name of a Saudi princess, is overgrown with plants and the signs on the ramshackle gates state it is under "24-hour manned guard".

"Not many true local residents live on the road," said Anil Varma, a property developer who is helping redevelop the former Saudi properties. "It is the likes of the royal families of Saudi Arabia and Brunei. They buy a property and don't do anything with it. No one has lived in some of these homes for 25 years and they are decaying. When we did the searches on some of them the water authorities said they had no records of any water being used."

One resident of the avenue, Magdy Adib Ishak-Hannah, an Egypt-born doctor, said he had never met his neighbours and believed as few as three of the properties were occupied full-time.

Another resident from Iran, who asked not to be named, said: "95% of the people who live here don't actually live here. It is a terrible place to live really. It is very boring and the road is very busy. I don't think many people want to live in such big houses anyway."

Estate agents and property developers said the avenue was in transition, with apartments under construction that would bring life back to the area, but said high vacancy rates were inevitable in an international market such as London where buyers come from the Middle East, Russia and increasingly China.

Trevor Abrahmsohn, an estate agent who has overseen 130 deals on The Bishops Avenue since 1976 through his company Glentree Estates, said



23rd January 2014 - LONDON: The Bishops Avenue. Houses that were bought by the Saudi Royal family in the 1990s and have been now sold. The houses have never been lived in and have been left to rot..Pictured is 'Georgians' on The Bishops Avenue...(Photograph by Graeme Robertson)..abandoned.rotting.urban decay.biavg Photograph: Graeme Robertson

any attempt to interfere with what owners do with their property would be wrong and the housing shortage should be tackled through reform of the planning system, wresting it from "political control".

He said: "Once you end people's right to buy something and do as they please with it you have a police state," he said. "One of the things people love about this country is its freedom and liberal views. You can't start affecting what people do with their assets. That is sacrosanct."

Andreas Panayitou, a property tycoon selling one of the empty mansions, Heath Hall, for £65m, believes The Bishops Avenue is improving and more people are starting to spend more time living there.

But he admitted that the derelict Saudi properties "really let the road down". He said he fully agreed with Boris Johnson that London homes were not "blocks of bullion".

He said: "You don't want empty streets and people just parking their money. You need people to live in them or rent them."

But he argued against increasing taxes on unoccupied homes, which he said would be an "annoyance" that would make buyers choose Monte Carlo or Milan instead of London.

What good is school? Let's hear it from the kids...

How better to highlight educational inequality in England than by talking to the pupils themselves? In this extract from a new book, schoolchildren from disadvantaged areas share their aspirations and challenges. Their answers, and comments from teachers, are both candid and poignant
By Ben Faccini and Greg Villalobos

Asking pupils what is preventing them from achieving their potential is like opening up floodgates. Some pupils hesitated a few seconds before expressing their aspirations but most quickly described some of the barriers to success in both school and society.

Just as pupils in cities expressed a greater range of aspirations, so city pupils from schools in challenging circumstances were more explicit in listing the obstacles facing them. The reason, they stated, was because they clearly understood what separated them from what society termed "success". They witnessed it on a daily basis, every time they walked past expensive shops in city centres, every time they travelled on buses through better-off neighbourhoods or simply when they observed high-earning professionals going about their lives on the streets.

In many ways this comparison to others defined who they were and what they wanted out of life. This wasn't necessarily the case in outer-urban or semi-rural settings, for example in Yorkshire, where students spoke of a lack of examples of success. Isolation there seemed to add another layer to the barriers in front of young people.

The influence of the family was often the hardest issue for pupils to discuss, maybe out of pride, a justified sense of privacy or even because of family dynamics. Teachers had often spent many an hour at parents' evenings seeing firsthand which factors hindered pupils and which helped them. Parental engagement with a child's education was not always a prerequisite of achievement, but there was no denying that it created more auspicious conditions for learning. A teacher with an ally at home was undoubtedly more effective.

Jack, 15, pupil, London

I live in Chelsea. My bedroom is quite a small room and I share it with my brother. A few shelves for books and a TV. My brother is 25 and I'm 15. The age gap does cause tension and he wakes me up coming home late or sometimes he gets up early. It affects how I sleep. In Chelsea you've got a huge divide, the richest people and loads of estates too. People think I'm rich when I tell them I live in Chelsea, but the reality is very different. We live in a mansion block split up into lots of flats. If you look at this school, generally, not everyone comes from the best background, but if you look at the top band, their parents have more education and they then have money to buy revision books and a desk, and they have more time to tutor and more space in their house.

Katie, teacher, London

You can have kids who first say "that's so boring" when I talk to them about *Tess of the d'Urbervilles*, but then I get to see it through their eyes, and it's amazing. One girl said to me recently, "Miss, I don't know what you've done to me. I go home and I analyse everything and pick everything apart." So for me, English is not so much about them writing the perfect business letter but about their souls and

their minds. Of course, they need to read and write as a skill, and it's a crucial part of their education, but I think it's also vital to have their minds lifted, to be able to critique the world. Literature allows for that, and it's also about real-life situations. *Tess of the d'Urbervilles* is about an outcast and her struggles. The subject is real. It matters. It brings out all the things [teenagers] experience.

One girl. I taught her A-level. She was followed by the child protection people. She had a terrible life but she was heading to Oxford. She was a brilliant student, naturally bright and very able. I would tell her that she was going to be able to walk away from her past life and create a new world for herself. Then, at the last minute, she didn't turn up for her A-level exams. We sent a taxi for her but when push came to shove, she couldn't do it. Some don't know how to grab your hand. I can't take the exam for them. At the end of the day they have to have parents who will fight for them too. There was nothing we could do as teachers - we weren't able to act on that last tiny bit. It broke my heart.

For me, the students need consistency and reliability from a teacher. I hope I deliver consistently good lessons, and I say to the pupils that if they listen and absorb things carefully they will succeed and get good grades. I tell them that education is their way out, and, I suppose, for many of the kids that don't succeed, it is because they don't know how to take that opportunity.

Sammy, 13, pupil, London

Some people in higher sets at school think you're dumb because you do lower tests. They look down on us. They say stuff. Teachers accompany you to detention and you feel like a kid. They always think you're up to something. It makes me want to prove them wrong. You can get a reputation in school, a bad reputation, and it stays with you. School can be fun, but not when you're labelled. I get in trouble for fighting. I had a fight with him [pointing at a boy opposite] but we're friends now. They set us up. We were pushed into it by people. They sent us to a place where people are permanently excluded, where they have behavioural problems and the like, and they treated us like we were mental. Each person had someone following them around. There was another school opposite and they came in and caused trouble. There were people kicking down doors. There were fights. We have fights, but we're friends again. There are people who push you into fights because they are bored.

My parents are more like friends but if I get into trouble they will lecture me and tell me their example. They won't tell me off. My dad can't tell me nothing too much as it would be hypocritical - he got excluded from every school he went to. He got excluded when he was 11. He's like "learn from my mistakes".

For me, the problem is that there are no youth clubs. There are no second chances - if you get a bad label you have to live on benefits and you don't get enough money, only a bit for clothes and food, but you can't live on it. The rich stay rich. There are no equal chances. If you make a mistake at school you should still have a second chance of getting a job like anyone else.

Cyrus Teacher, Barnsley

There was one lesson when we were doing distances and there was a simple question: what's far-

ther, Manchester or the sun? And quite a few of them put Manchester, and I just couldn't understand why. They explained: well, to get to Manchester you've got to take, like, two trains and that takes hours, but the sun's just there! And that's the logic: "Oh, you can only see what's in front of you." And then the idea that actually if it's farther away, if you can't see it, then it's just too far.

What I've found quite frustrating, especially at a higher end, is that the kids that are really bright and get good grades, and actually have a good work ethic, don't realise just what they can do with their lives and the possibilities and the potential that they have - they just don't realise, they don't think they're good enough. The amount of under-confidence in so many kids is quite disturbing.'

Kimi, 16, pupil, London

When I arrived in London from France a year ago it was just an enormous sense of relief. I was going to live on my own with my dad for the first time. I felt strong and confident, full of hope. I was booked on the international baccalaureate course at Westminster Academy and I was going to do my tennis. Now I know Britain is a closed circle, and if you're not rich or in that circle, you won't get anywhere. It's about connections and hierarchy, full stop. It doesn't matter how good you are, it's who you know. And if you don't know the right people then you're not welcome. My dad managed to find a coach to introduce me to a private tennis club. I went to play and the coach was impressed by my skills. The head of the club saw me from her office and made a fuss about my scruffy trainers. She got the coach to ask me to stop playing and leave the premises. She didn't even dare come and tell me herself. I felt really humiliated. It wasn't just that she thought my shoes were shit, I felt as if my whole life was being called shit too.

Cleveland teacher Josh believes that too many young people lack positive role models.

Josh, teacher, Cleveland

I'm from this area. I've been away 15 years and I've really enjoyed coming back, but that's because I've known those other experiences and opportunities and had the option to go wherever. I don't think the kids here appreciate that you can go off and do things like I did and not just be focused on this area. You need to open your mind a bit. Not that this area is bad, but you need to know you can get away.

The school I started working with in Stockton was on an estate and there was a shop too. There was no reason for the kids to leave the estate. The school was a real community school, a haven for those kids who had TVs in their houses but had mattresses on the floor, and the school was warm and welcoming and friendly. Certain kids, of course, didn't want to be at home.

Some kids here are in poverty but it's not as obvious as in Stockton. The problem here is that you can get three generations of unemployed, so the aspirations are non-existent for some of the kids. There is no role model, no one who goes out in the morning to work and comes back in the evening. Their role model can be the person who goes to the job centre to get their benefits, or the teenage girl getting pregnant. That's changing. We've only got one pregnant girl here now but it has been higher in previous years.

Lots of kids come from farming backgrounds and,

again, lack aspiration. They could be involved in farm management if they wanted but they work as labourers. They don't see another route.

Casey, 13, pupil, Birmingham

I'm not from here. I moved to Birmingham about a year ago. Some of the kids [from the area I live in] come to this school. They are good children. Basically they see themselves as something different but if you actually talk to them and get to know them, they are good people. They like attention. They are disrespectful to teachers to make everyone laugh, but if you're like that you haven't got manners. They say, "I don't care about school", that kind of attitude. They are not going to get anywhere in life. In the future they're going to think, "I wish I'd paid attention". They are jealous if you're better than them at school. I don't care what they think. I

be embarrassing for the rest of the class but they don't necessarily seem to care if they're in bottom sets. Even students who are seemingly apathetic, I see their families at parents' evening and they are committed but just don't know how to get there.

Josh, 16, pupil, Cleveland

I think my mates are perhaps the ones who might be a barrier. When I'm in science I'm good, even if I'm with my mates, but other times it's always in the back of my mind to mess around. I know people who mess around, but what are they going to get out of school, what are these five years going to be for? Most of my mates' dads work at Corus [mining company], and they might get their sons in. My dad only just started in his business but I hope most of my friends will get jobs and not be on the dole, getting paid for nothing, just sitting around.

ther too loud or too quiet. It's in those two extremes where the problems lie.

Greta, 15, from Cleveland, admits that she can be 'too laidback' but says she is inspired by a fellow pupil who is 'aiming high'. Photograph: Greg Villalobos

Greta, 15, pupil, Cleveland

There's a bit of a stereotype that people get stuck with. It comes with the area really - the "north". It's just presumed you're going to work at the steel-works or the fishing industry. Some people think that's the only thing they can do. But I know a lot of people who are aiming higher and want to do something else, something a bit different. My friend, she wants to open an arts centre, but she'd like to work with kids. She's thinking big, like a business plan and having a chain of arts centres. She's really into the idea and I know she can do it. It's not just one of those "oh yeah, that would be fun but probably never going to do it" type things. She's really conscientious about everything she does. If it's about helping other people, she's never going to back out on them. She's always there to listen. She's hands-on about everything. I've never seen her be late to anything! She inspires me, spending time with her, because I know I can be a bit, like, "oh yeah, do it some other time". I can be laidback, a bit too laidback to be honest. But spending time with her inspires me to actually keep going for myself and actually do what I want to do.

Some names have been changed

Extracted from We Need to Talk About Education by Ben Faccini and Greg Villalobos, published by IndieBooks, available at bookshops, online or via Teach First

Through interviews with pupils, teachers, parents, and community members, *We Need to Talk About Education* shines a light on the wide-reaching impact of educational inequality in England. With a particular focus on London, the Midlands and the north-east, the book gives voice to young people in state schools to uncover how their aspirations intersect with their educational opportunities, family life, housing, community and friendships. Answering questions such as "What do you want to be?", "What are you going to do about it?", "What could stop you?" and "How can teachers make a difference?", children from underprivileged areas give candid and poignant responses which reveal the extent to which their background can affect their potential and self-worth; and their teachers (along with youth workers and parents) recognise and articulate these challenges with equally powerful anecdotes. Co-authored by writer Ben Faccini and photographer Greg Villalobos (who have worked extensively with children in deprived areas), the book was commissioned by Teach First, a charity that seeks to end inequality in education by recruiting and training bright graduates to teach in low-income areas. Inherent in their work is the belief that great teachers make inspirational role models for children and can create positive change in their lives. Their intensive training is the focus of the current BBC3 documentary series *Tough Young Teachers*, which follows six graduates in their first year as teachers in disadvantaged schools. **Corrine Jones**



Casey, 13, from Birmingham, says he has 'picked himself up' and turned away from the 'wrong path' he was on. Photograph: Greg Villalobos

just do what I'm doing. I stick to my path. My mum told me at the beginning what was going to happen at school and what was not going to happen. I did get myself on a wrong path but I picked myself up.

Seb, teacher, Birmingham

There's a gap between student aspirations and how they're going to get there. All their aspirations are quite materially based, or professions like doctors, but most don't understand how to get there. If you were to pick a typical student they might well be apathetic at school but be aspirational in terms of finance. Of course, many are not like that, and many are some of the most inspirational people I have ever met. There are kids who are getting A*s when two thirds of them are not passing maths or English. Others, it seems, sometimes want the indicators of success, like new trainers, but the rest - the hard work and the education - isn't visible.

The important thing is their role models. There are kids on free school meals who have an iPhone, and the problem is the aspiration to the item rather than a degree certificate. I had one girl who came from Iran aged 12 and she couldn't speak a word of English, and now, aged 14, she is top of the top English set, above all her British-born peers. It should

Phil, teacher, London

I have come across disadvantage. It jumps out at you from time to time. I was shocked to discover, when I asked the students to bring in calculators, that some didn't have one because they couldn't afford it. One said she couldn't afford a pencil case either. I told them I would write a postcard home to congratulate them on their achievements, and one girl told me not to bother as there was no one there to read it. She lived in a hostel.

Beyond this, the main shock for me has been to see how the students change in attitude from Year 7 to Year 10 and 11. They are really motivated at the beginning - you can't see the difference between the kids' various backgrounds. Those on free school meals seem to be doing as well as those from better-off families. Then, gradually, it's as if the desire for learning falls away for some and it becomes cool to not do well. Of course, I question myself if kids display this pattern or others behave badly. Sometimes I discover it's because they have found some questions too hard or an explanation hasn't worked. I analyse the problem, and that's how I motivate those who are struggling or those who are less advantaged. I have to keep an eye on those who are ei-



High dive ... New York at night. Photograph: Jason Hawkes/Barcroft Media

Swimming in New York: the pool on the 42nd floor

Le Parker Meridien hotel in Manhattan offers you the chance to swim high above the traffic, with views over Central Park. But it was the people who made all the difference, once again

By Jenny Landreth

I wrote last week about swimming in New York's not-for-profit pools. This week, I'm dandling about on the "for profit" side. I'm going up in the world.

Up to the 42nd floor as it happens - two blocks below Central Park, so you know the views will be special. The other two pools I'd visited had been firmly bargain basement, but it seems that the more money you have, the higher you can put the water. The pool on the 52nd floor of the Shard will prove my point, if it ever opens. Richard Branson is probably planning a Virgin Moon™ pool as we speak.

There are a few rooftop pools in New York; this one belonged to the Le Parker Meridien hotel on W 56th, which we nearly walked past, so discreet was its frontage. The lobby was less discreet - a mix of very hi-gloss modern with Corinthian-shape pillars and marble. On one wall was a piece of contemporary art made apparently from vacuum-cleaner bags and, by the lifts, a mockup of a traditional barber shop complete with authentic signage. The lift came with swooshing sound effects, which were a bit Dr Who 1994. We arrived on the 42nd floor to find they were playing host to the Self Storage Association Economic Summit; tempting though it sounded, we decide to forego the session on "Deals of the Year" and get straight into the water.

The pool room is stunning, with two sides of high glass giving you vertiginous views - right over the park on one side, though an obscuring fog was

down. There's an A-shaped glass roof - they've missed a trick not having it open to the sky in warmer months (like the one at the Berkeley hotel in London). It takes a second for your pupils to open to the space, for your ears to adjust to the muted noise; it felt unexpectedly, disorientatingly quiet up there, particularly when you can almost see the noise of the streets below, and have just felt the loud hum of the Self Storage Association Economic Summit. We grabbed towels, changed and got in, joining a woman exercising with a pool noodle (not a euphemism).

The pool is half-sized; plenty for the holiday dandler who swims without getting his or her hair wet, but not quite big enough for serious lapping. It is deep, though, so you can practise your tumble turns, play, potter, relax. You'll feel part of a different New York, where the towels are thick, the product plentiful, the atmosphere rare and restful. It's well-cushioned in every respect. And there's something to be said for standing in your costume, nose pressed to the glass, drinking in those views - if your stomach will allow.

Sometimes you meet people that you know are going to stay in your mind for a long time. It happened to me with the late Dr Andy. The old king of Tooting Bec lido, he was much loved and respected in the way that clever, dry, humorous kings are. When there were two walking sticks by the steps, you knew that Dr Andy was in the water somewhere. He had his own rules of cold swimming (we all do), and described the temperature of the water in winter as "either cold, or fucking cold" - an observation given more bite by the fact that he

wasn't a swearsy type. Dr Andy swam into his 90s and died two years ago; though I never got past more than a few sentences with him, I think of him often.

It happened again in New York. The pool-noodle woman introduced herself within a minute of us getting in as Hattie Retroage, a self-described "extreme cougar". A swimming cougar - a swougar, if you like. She didn't particularly like being called a cougar, but it is the term by which people have come to understand her preference for sleeping with much younger men. (The youngest, a couple of years ago, was 18; the fact that my son is that age would have added nothing to the conversation.) Hattie is in her late 70s and looked utterly fabulous, lithe and alive. A force of nature in a cut-out swimsuit, she's been a resident of New York for her whole life, until she recently decamped to the West Indies. We learned much about Hattie and from Hattie - everything from the poison of GM foods to herbs that help the menopause (royal mace); from the best kind of hip replacement to her life as a young communist in 50s Brooklyn. From what to clean your teeth with (peroxide, bicarb and a bit of mint, for flavour) to the best Greek restaurants in Manhattan (Molyvos, apparently). The advice flows from her to me to you, like some weird Chuckle Brothers sketch.

We found out, too, that Hattie had been filmed for TV's Extreme Cougar Wives in that very pool. I pride myself on my pool-spotting abilities, and have been known to shout "Hampstead Ponds!" in a crowded cinema (Tinker Tailor Soldier Spy). When you're watching Extreme Cougar Wives, you can do the same - you're welcome. We talked for an hour, bobbing in the deep warm water, until we looked up and realised it had gone dark outside and we had to hurry and change. We took a quick snap of Hattie and a last look at the view, now lit with distant neon from below.

We shared the lift down again with a delegate from the Self Storage Association Economic Summit. I asked him how it had gone. "It was a great day," he said, and went on to tell me that "the self storage industry is bigger than Hollywood". So next time you go see a movie, be grateful people still bother to make films when the glamour and cash of the self storage industry beckons.

Will anyone ever run a sub-two-hour marathon?

No one has ever run a marathon in under two hours. Is it possible – and could it happen in our lifetime?

Join David Epstein for a live chat on Monday 3 February at 1pm BST

By David Cox

Every morning, as dawn breaks across the shimmering blue mountains of Kenya's Great Rift Valley, a series of shadowy figures assemble at the various training camps dotted around the town of Iten. Gradually, some in clusters, some alone, they slip away for the first of the day's extended runs.

Ten years ago, these young athletes would have dreamed of winning gold medals on the track – but those days are long gone. The marathon has always been the holy grail for every distance runner, but it used to be the discipline they turned to once their track speed had faded. Nowadays, the financial rewards offered by the big city meets mean the marathon attracts the world's finest endurance specialists at the very peak of their powers. Perhaps one day, one of them will shatter one of sport's most imposing barriers: the sub-two-hour marathon.

The very idea of it appears almost inconceivable: 26.2 miles in 120 minutes, requiring an average speed of 13.1mph, something most of us would struggle to manage for 400m. "When I look at a two-hour marathon from a pacing and a physiological perspective, right now it seems really unlikely," says David Epstein, the bestselling author of *The Sports Gene*.

"A guy would need to have as high an oxygen capacity as has ever been recorded, and the best running economy [how efficiently you use oxygen while running at a given pace]. Those two things almost never seem to come together. And from a pacing standpoint, the elite guys usually run the first half of a marathon 2.5-3 minutes faster than the second half. So they'd have to run the first 13 miles significantly faster than has ever been done before."

Back in September, Kenya's Wilson Kipsang lowered the world record to 2:03:23 in Berlin. On the face of it, we would appear to be tantalisingly close –



Wilson Kipsang crosses the line in the London Marathon. Photograph: Rex Features

but then you have to consider that the record has only dropped by two minutes over the past 14 years.

Ethiopian distance king Haile Gebrselassie won two golds on the track before turning to the marathon at 29 and twice breaking the world record in his 30s. He believes that it may well take another 25 years before we see anyone capable of going under two hours. Uganda's Stephen Kiprotich, though, the current Olympic and world champion, believes there's room for optimism.

"Lowering the record to 2:02 will be done soon, definitely before the next Olympics in Rio," he said. "Then it will again take some time. The sub-two-hour marathon will happen, but it's impossible to set a timeline. But the good thing is that in the past few years, training camps in Africa have professionalised a lot. When I was a teenager we just trained; now I have a coach, a physio, a manager, a GPS watch. We have people during long runs who assist with drinks to simulate drinking station situations. All these things make a difference. But we still have lot of room to improve if you compare our training camps with some of the European and American runners. They have a lot of technology and knowledge we don't have."

Epstein believes that the feat is beyond the current generation, and suggests it may not even happen within our lifetime. Such are the physiological challenges that ultimately it will come down to the evolution of our genes.

"The faster the races are getting, the more people are ruled out purely because of their genetics," he said. "Oxygen capacity is what sets the pros aside from everyone else in the field, but what separates the pros from each other is usually running economy, and that's largely something that you're born with. You can improve what you have through working hard – and Paula Radcliffe was a great example of that. She improved her running economy with altitude training and she lost weight while she was still growing. However, there's still a certain body type that you naturally need to have, and of course you have to combine that with ferocious training."

But would it be possible to spot a runner with the ideal genetic makeup and nurture their potential from an early age? A lot depends on how the genes are expressed, which is one of the most fascinating

and little understood areas in medical science.

"There's a lot of theory that living in a certain way turns the genes on and off, based on what the parents did when they were forming their germline DNA," Epstein explains. "This means what your mother was doing when she's pregnant with you and what your father was doing when he was going into puberty."

"But otherwise it's sort of unknown. I think there are certain lifestyle factors, specifically relating to runners in Kenya. A lot of them are primed for training, because they're not overweight and they grew up running, so they can start training really quickly instead of having to start by jogging. The first sub-two-hour marathon will probably be run by someone from east Africa."

We may have a while to wait, but whoever becomes the first to stop the clock at 1:59:59 will have accomplished one of the most significant achievements in sport. "It will be a great milestone and an indicator of what the human body can do," says Kiprotich's coach Patrick Sang. "It will show that what is impossible, can be possible."

Epstein believes that, in some ways, it may have a greater impact than the four-minute mile. "That was obviously huge, and part of the psychological rebuilding of post-war Britain," he said. "But the sport was also contained to a very small portion of the world at that point. Not that many people were competing in running, and not many countries recognised the mile in the same way that the United States and Britain do. But everyone recognises the marathon distance, and it's a globally competitive sport. The marathon has never been more popular – it's the greatest participator sport that we have going right now – so I think a lot of people could really relate to what it means."

Diamond: Britain's answer to the Large Hadron Collider

At the Diamond particle accelerator in Oxfordshire, experiments using beams of light 10,000 times brighter than the sun have implications for the fight against cancer, improved air safety and energy efficiency

By Brian Clegg

The darling of particle physics might be the Large Hadron Collider (LHC) at Cern, but as a practical tool it's no match for the UK's Diamond Light Source. Located at the Rutherford Appleton Laboratory campus at Harwell in Oxfordshire, Diamond is an alchemist's dream, a place where beams of light 10,000 times brighter than the sun are deployed to probe the nature of everyday things.

Diamond is the Marmite of the physics world. Just as the sticky gunk left over from the brewing process was repurposed as a savoury spread, the light that streams from Diamond was originally the waste product of a particle accelerator.

Diamond's 561m-diameter ring, which gives the building its distinctive circular shape, houses a synchrotron. Like the LHC, this is a particle accelerator, in Diamond's case using synchronised pulses from powerful magnets to accelerate electrons to near the speed of light. Synchrotrons were part of the earliest particle accelerator technology, dating back to the 1940s, and were soon found to have an unwanted byproduct. Because they accelerated electrons, they generated light, known as synchrotron radiation.

When an electron accelerates it gives off energy in the form of electromagnetic radiation. Almost everyone owns an electron accelerator - the transmitters in mobile phones generate radio waves by accelerating electrons in aerials. But synchrotrons push electrons to relativistic speeds and the acceleration of electrons around the ring produces a whole spectrum of electromagnetic energy from mi-

crowaves, up through infrared, visible light, ultraviolet and x-rays.

This happens even though the electrons travel around the main storage ring at a constant speed, because acceleration is a change in velocity, which combines speed and direction. To keep the electrons in the ring they are regularly shifted through small changes of direction by steering magnets, each of which results in an acceleration and a blast of light.

In the early synchrotron light sources, such as Diamond's predecessor at Daresbury in Cheshire, this acceleration round the ring was the sole source of light, but in a modern, so-called third generation ring, electrons are also given extra acceleration by passing them through a series of alternating magnets to force the particles into a pattern of repetitive oscillations. These devices are known as undulators if they produce a tight, narrow oscillation generat-



The huge Diamond Light Source in Oxfordshire: inside it's 'like something out of Star Wars'. Photograph: www.diamond.ac.uk

ing a narrow band of radiation, or wigglers if they produce a wider band.

Around the storage ring are ranged beamlines, exit beams for the radiation, where work stations known unromantically as hutches house the experiments. In Diamond's massive 45,000 sq metre floor space (around eight times St Paul's Cathedral) there are currently more than 20 beamlines, with space for 40 in the final configuration. "When you walk into this big hangar of a place," says Diamond researcher David Cole, "it's like something out of *Star Wars*."

Though Diamond is a massive project, constructed between 2003 and 2007 with funding split between the Science and Technology Facility Council (86%) and the Wellcome Trust, it was relatively cheap with an initial construction cost around one-tenth of the LHC's £2.6bn. Of course, Diamond is not on the same scale of build, but in terms of what it delivers it more than compensates.

Each year, a remarkably wide range of projects compete for time on Diamond's beamlines, which run 24 hours a day, outside planned shutdowns. The light produced here is beyond anything that a university could deliver in a lab. Diamond's x-ray sources, for example, are 100bn times more powerful than a conventional x-ray tube. While it is possible to produce lasers that develop as intense a blast of light as a synchrotron source, they are nowhere near as flexible because a laser is limited to a narrow range of frequencies, where Diamond produces a wide spectrum. Practically every application of Diamond requires a different frequency, fitting the sample being studied.

The sheer range of applications is remarkable. The powerful blasts of light or x-rays enable scientists to study the makeup of materials in unparalleled detail, deducing the structure of molecules far more complex than the DNA that so challenged researchers in the 1950s, establishing the exact chemical makeups and physical properties of tiny samples and finding subtle variants in the structure of manufactured items that can lead to stressing and failure.

As Professor Trevor Rayment, Diamond's physical sciences director says: "Particle physics machines such as the LHC enable scientists to pursue inspirational goals, such as discovering the nature of dark matter, which most of the universe is made up from, and they deservedly have a high profile... [but] facilities such as Diamond are accelerating discoveries across a vast expanse of science and technology."

He gives the example last year of a team from Oxford, Reading and the Pirbright Institute who "used Diamond's intense x-rays to design a much safer vaccine for foot-and-mouth disease, which is endemic throughout much of the world, costs \$5bn [£3bn] a year, and causes much suffering in poor countries".

It would be a shame if particle accelerators working on particle physics were to overshadow Diamond's remarkable work, which not only expands our scientific knowledge but makes possible the development of new drugs, new approaches in electronics and aircraft that fly more safely. The Diamond Light Source is a true national treasure.

The earthworm uncovered

Dr Mark Hodson from York University has been using Diamond in two projects based on a peculiar constituent of earthworm casts. "As a mineralogist, I was interested in rocks and hence soils, but I only gradually realised that biology is also important," he says. "There's plenty of work on bacteria, but I like things I can see and went to an earthworm conference, where an archaeologist was presenting on the importance of balls in worm poo to climate reconstruction."

As well as the usual contents of faeces, earthworm

casts contain small granules of calcium carbonate. This is a common mineral - the stuff of limestone, marble and chalk. These roughly spherical granules, around 2mm across, can remain in the soil for tens of thousands of years. They were already of interest for climate research, as they can be dated well from the decay rate of uranium that is incorporated into them, and the balance of oxygen isotopes in the carbonate gives a good measure of the temperature at the time the granule formed, but Hodson has more present-day concerns in his sights.

He initially used a Diamond beamline to determine how effective earthworms might be at cleaning up soil that was contaminated with heavy metals such as lead and zinc, a process known as remediation. These metals can leach out of the soil into ground water, poisoning the water supply. "We were looking for a way to give the metals something to stick to. We had already seen that earthworms can survive in contaminated soils and so began to culture worms in appropriate soils to see if they could lock up the heavy metals in the calcium carbonate, reducing their mobility."

In these earlier experiments, Hodson was using powerful x-rays to provide a spectroscopic analysis of the calcium carbonate granules produced from the contaminated soil to find out how much of the heavy metals were being locked away. The outcome was frustrating - the metals were being held in the calcium carbonate, but not in sufficient quantities to remediate the soil. The worms would not provide an adequate solution in any sensible timescale.

Now Hodson is using an infrared beamline to examine a very different aspect of the granules that could transform our understanding of a key industrial material. Most calcium carbonate comes in one of two crystalline structures, calcite and aragonite, with a small amount of a third, vaterite. But there is a fourth form, amorphous calcium carbonate, that would be very interesting if it could be produced on a large scale, as it lacks the tendency to shear along planes that typifies the crystal structures.

The worm granules contain all four kinds of calcium carbonate, and the amorphous form can last for years. "This is remarkable," says Hodson, "as amorphous calcium carbonate is very unstable. It usually crystallises very quickly. In the lab it might last five minutes. We are trying to find out what causes that stability in the granules."

To perform the experiment, Hodson and his co-workers cut thin slices of the granules and map out the different forms of calcium carbonate every 5 microns (millionths of a metre) through the sample. If it is possible to discover what other substances are stabilising the amorphous form, it could have a whole range of uses, from changing the brightness of paper and other products that use calcium carbonate for whiteness, to reducing the build-up of scale in pipes or modifying the strength of building materials.

The power of Diamond's light source makes it possible to study the detailed constituents in place. "In the laboratory we can identify the presence of various elements with granules that have been ground up. That way we can see what's there, but not why the amorphous calcium carbonate is stabilised. Here [at Diamond] we can match up the locations." The brighter the light, the better the resolution that can be achieved in examining the samples - and Diamond provides an unmatched intensity.

This work is still under way. Hodson estimates they are three to four years from a definitive finding. But the potential of the earthworm to transform our understanding of a substance that has been a key building material since the pyramids is impressive.

Cancers captured

Since 1915, when the father and son team of

William and Lawrence Bragg won the Nobel prize for using x-rays to analyse the structure of crystals, it has been apparent that this would be a valuable technique for understanding the way that atoms are linked to form molecules. But it is hard to imagine that the Braggs could have envisaged that their work would provide an essential tool in the search for a mechanism to cure cancers.

Pierre Rizkallah and David Cole from Cardiff University are using the Diamond Light Source's intensely powerful x-rays to establish the modifications needed to give T-cells - a form of white blood cell - the ability to latch on to and destroy cancer cells.

T-cells have a unique ability to look into another cell and determine whether it is friendly or alien. Proteins on the surface of the T-cell called T-cell receptors can scan another cell by locking on to MHC (major histocompatibility complex) molecules, which protrude from the surface of cell. These MHC molecules reflect the internal makeup of the cell - by "reading" them, the T-cell can identify whether the cell it has approached should be ignored or destroyed.

At the moment T-cells rarely attack cancer cells. "The big problem the T-cell has is how to differentiate healthy cells from cancer cells," Cole says. "It is difficult for the T-cells as cancer cells look similar to normal cells. We are looking at whether it's possible to do anything to the interaction so that the T-cells can react."

Initially the team is focusing on skin cancer, but in principle the methods they are using could be applied to any cancer cells.

The first requirement is to determine the complex shape of the receptors on the T-cells, to be able to modify them to lock on to the cancer's MHC molecules. The traditional method, used for example in the determination of the structure of DNA, is to produce a crystal form of the substance to be studied, then blast it with x-rays. As the x-rays interact with the atoms in the repeating structure, they are diffracted, producing a pattern of dots, which is analysed from various directions to allow a painstaking build-up of the structure of the molecule.

This can be a slow process. Rizkallah explains: "It takes hundreds or thousands of exposures to build up the structure. This is where a synchrotron like Diamond is much better than a traditional x-ray source. With a traditional source the image is barely distinguishable. When I first started, using such sources, it took around eight hours to build a single image. [At Diamond] with much higher resolution, it initially took 15 minutes and now is a fraction of a second."

"It wipes out anything we could do in the laboratory. When I started one structure would take three years for a post doc to determine. Now we can analyse three in a day."

Once the receptors are better understood the aim is to discover which parts of the molecular structures are touching each other by using crystals that combine the T-cell receptors and the MHC molecules. From this the aim is to work out how to artificially enhance T-cell receptors to attach more firmly to cancer cells, enabling them to attack and destroy the cancer. Treatment would involve taking a patient's own T-cells, modifying them and returning them to the cancer site.

By providing unique speed and resolution, Diamond Light Source is enabling fundamental research in what could form one of the biggest medical breakthroughs of the 21st century.

Diamond has four public open days a year, when visitors can pay an in-depth visit to the facility.

Reappraising Eddie 'the Eagle' Edwards

The British ski jumper was mocked for his performances at the 1988 Winter Olympics in Calgary, but he was a fearless and dedicated athlete who sacrificed a lot to make it to the Games

By Steven Pye for That 1980s Sports Blog, part of the Guardian Sport Network

Sport, especially in this internet age, divides opinion. As soon as anything even slightly contentious happens, you can feel the controversy coming. It makes you wonder how the modern world would have coped with some of the sporting events of yesteryear. Take Eddie "the Eagle" Edwards.

For some, he was a hero who sacrificed a lot to live the dream: an athlete who competed with a smile on his face, and deservedly reaped the rewards of his unexpected fame while he could. For others, Edwards was a laughing stock who belittled both the sport of ski jumping and the 1988 Winter Olympics, and represented everything that was bad in a nation that seemed to adore sporting losers. Either way, the story behind Edwards' rise to stardom is still fascinating all these years later; and love him or hate him, you cannot deny Edwards his place in Winter Olympics history.

Edwards' progression from a downhill skier to a ski jumper was born out of necessity. Trying and narrowly failing to qualify for the 1984 Olympics as a downhill skier, Edwards soon began to run out of money, and in 1986 he had a decision to make: "I didn't have much money, so thought I'd better find something cheaper to do. I went along to the ski jumps [in Lake Placid, where he had been training] and thought: that looks alright."

After a couple of hours on the 15m jumps, Edwards moved on to the 40m version and promptly fell on landing. It wouldn't be his last accident. Five months later, Edwards had stepped up to the 70m jump and was now on a mission to get to Calgary in 1988.

Inevitably, things did not run smoothly. Without financial backing, and with no ski jumps in Britain, Edwards borrowed his mum's car and drove around Europe to qualify for the Olympics. In 1986 he jumped a British record distance of 68m in Kandersteg, Switzerland, to bring his Olympic dream that much closer.

Edwards' European tour was not a bundle of laughs. Penniless, he had to take up a variety of part-time jobs, including babysitting, cutting grass, working in hotels and cooking. At one point he ended up staying in a Finnish mental health hospital paying £1 a night for the privilege - it was there that he would discover that he had made the Olympic

team - and such was his shortage of money that on another occasion he broke his jaw, but could not afford the medical bills, so tied it up himself with a pillowcase and simply carried on. No one said it was going to be easy.

On top of the monetary concerns, Edwards had worries about his sporting life. Wearing six pairs of socks to make his second-hand boots fit, and a helmet tied on with a piece of string as it was too big for him - on one landing his helmet fell off, before the Italy team kindly provided him with a better fit - Edwards also had the problem of far-sightedness, which meant he had to wear glasses while jumping. "Sometimes I take off, and I can't see where I'm going," admitted a rather blasé Edwards, who didn't seem at all concerned that his glasses misted up in mid-air and restricted his vision. Sheer madness.

By Boxing Day 1986, Edwards was taking part in European Cup events - his debut was at St Moritz - and he represented Great Britain at the 1987 World Championships in Obertsdorf, Germany. Unsurprisingly, he finished last. His popularity among crowds at World Cup events was growing, but he had no idea about the reception he would receive in Calgary in February 1988.

Arriving in the early hours of the morning, Edwards' accident-prone nature extended to the carousel of Calgary airport, his luggage bursting out of his case and spilling pants and socks everywhere. Undeterred, he jumped on the carousel and chased after his clothing - hardly the ideal start to his Olympic experience.

And then came the first signs of what was to follow; waiting outside was a Canadian TV crew and a fan club with a banner that declared: "Welcome to Calgary, Eddie The Eagle". That nickname had been mentioned for the first time. The Eagle had well and truly landed.

Startled at first, Edwards gathered himself, before revealing his clumsy side again, as he went to greet his adoring public: "I walked towards [the banner] but the automatic doors had been turned off, so I walked into the glass and my skis bounced off the doors, everything broke and I became Mr Magoo." His fans, aware of Edwards' finances, handed over a collection to their hero, who was quickly becoming one of the central figures of the Games.

Indeed, many of the world's media decided to attend a press conference with Edwards, rather than sitting through a briefing from IOC president Juan-Antonio Samaranch, although Edwards got lost in the Olympic village and was not allowed to enter the media centre due to a lack of accreditation.

When he did speak, Edwards was constantly defending his right to be at the Games. "Where is it written that the Olympics are only for winners?" said a determined Edwards, and in some press quarters he had his backers.

The Times' David Miller, who before the Games wrote about Britain's ski jumper Michael Edwards (Eddie's real name), was certain that Edwards and his British team-mates deserved to be at the Olympics, referring back to Baron de Coubertin's original philosophy of the taking part being more important than winning. As the days went by, the debate raged on, as the cult of Edwards grew and grew.

Amid the media circus there was actually a ski jumping event at the Winter Olympics. To the purists, Matti Nykanen's two individual golds were thrilling confirmation, if it was needed, that the Finn was one of the all-time greats. Yet for many of the 46,000 crowd watching the first event (the 70m jump), there was another heroic performance on display that Valentine's Day. He may have only jumped 55m on both attempts, but Eddie the Eagle was afforded an ovation worthy of a winner.

As soon as Edwards appeared at the top of the ramp, the crowd began chanting "Eddie, Eddie" repeatedly, as the man himself held his lucky charm - a golden boot given to him by his girlfriend Hannah - and said his usual prayer: "May I survive and come through this intact". Edwards had written Eagle in gold on his helmet as a tribute to his followers, and although he finished last and was a full 16m behind his nearest competitor, neither Edwards nor the crowd left the venue disappointed. Britain's first ever ski jumping representative fully soaked up the adulation.

However, not everyone was enamoured with the attention he was receiving. The East German newspaper Junge Welt labelled him a "clown", accusing Edwards of debasing the Olympic Games. "Where would the Olympic Games go if the Eddie Edwards of this world took their place in every discipline and so discredited the sporting achievements of all those who far outstrip them in ability?" questioned the East Germans, who were not alone in voicing their concerns. At the end of the Games, the Malcolm Folley of the Express wrote: "In future, competitors should be required to meet qualifying standards, before they are allowed to enter."

If the authorities had their way, that would have been that for Edwards' Olympic involvement. Before the 90m event, Calgary had been hit by strong winds, delaying both the men's downhill race and



Eddie Edwards in mid-flight. Photograph: Bob Thomas/Getty Images

the ski jumping. Norwegian Torjborn Yggeseth, director of the event, approached British officials and asked them to withdraw Edwards from the final: "On a day with marginal weather conditions I would ask Edwards not to jump," said Yggeseth.

The appeal fell upon deaf ears. "Under Olympic rules we did not have the power to ban him from making the first of his two jumps," said Yggeseth. "But yes, we did go to the British delegation and asked them to withdraw him. Evidently they decided he could manage."

Between the events, Edwards had been bombarded with publicity, so much so that the British Skiing Federation set up a trust fund to cope with the flow of cash coming in - as Edwards was an amateur, his earnings could not go straight into his pocket - and the British Olympic Association helped to find him a manager to control his affairs. Edwards needed all the help he could get, with offers flying in from companies such as Vladivar Vodka, Olympus Cameras, Hamlet and Cadbury. Edwards was a man in demand.

The night before the 90m final highlighted the fuss surrounding Edwards' every move. Invited to a supposedly private dinner with his family at a club, Edwards was shocked when hordes of reporters and TV crews appeared. Chaotic scenes ensued, as Edwards - billed by the club as "the man, the myth, the legend" - was invited onstage with a group of showgirls called the Eaglettes.

After two postponements, the 90m event finally took place. As Britain's Wilf O'Reilly was winning a gold medal in the demonstration sport of short-track speed skating, Edwards was gaining considerably more attention for again coming last, although he had some consolation in setting a new personal best and a British record of 71m. And he had managed to get through all his jumps without serious injury, which was a blessing for everyone.

Just one day later, Edwards was whisked away from Calgary, flown first-class to Los Angeles to appear on the Johnny Carson show, along with international film star Burt Reynolds. Heady times indeed.

Edwards was not finished in Calgary though, returning for the closing ceremony, which would be another remarkable occasion. In his closing speech, Frank King, the chief executive of the Games, mentioned Edwards: "You have captured our hearts. And some of you have soared like eagles." Cue thousands of people crying "Eddie, Eddie, Eddie", as the 24-year-old stood up to milk the applause.

Before the Games, Edwards had been a little-

known plasterer from Cheltenham, a man who was only famous to those of us who watched Ski Sunday. But during the Olympics this changed dramatically, as the Eagle was front and back page news throughout the Games, as the whole country sagged under the weight of the hype surrounding his activities.

Heathrow airport was positively swarming with press and fans - along with a model for Vladivar Vodka, who were attempting to get a photo snapped with Eddie - as Edwards made his way through the terminal on arriving back in England. There were no accidents on the carousel and no problems with electric doors this time as a considerably bigger crowd greeted him. Twenty police officers helped him through the mass of bodies (reportedly as many as 10,000 people).

Britain's new superstar was immediately whisked off to a London recording studio to make his Top 50 single Fly Eddie Fly - we could have done without that to be honest - and to appear on Wogan, albeit with Sue Lawley standing in.

A civic reception awaited in Cheltenham the next day. Edwards got trapped inside a Rolls Royce and desperate for a wee as thousands of people lined the streets, screaming "Eddie is our hero". Luckily, he found a toilet before boarding a beer lorry for his parade. For a time, Edwards' feet did not touch the ground.

From an overdraft of £2,500 and unpaid bills of £5,000, Edwards was now commanding top dollar, getting paid up to £10,000 an hour to open rides at Alton Towers and Blackpool Pleasure Beach. In one day he earned £65,000. Understandably, Edwards made hay while the sun shone, claiming to have earned between £500,000 and £600,000 in 1988 alone.

Through it all, the arguments for and against Edwards and his sudden rise to fame rumbled on. Simon Barnes of the Times was firmly in the Eagle's camp: "Don't condemn him for taking part in the Olympics and doing his poor best in them. Are the modern Olympics not for the taking part, but for the winning?" Yet the wheels were in motion within the IOC to make sure that athletes like Edwards did not get the opportunity to take part in the Olympics in future; in 1990 the Eddie the Eagle Rule was established, meaning an athlete had to be in the top 30 per cent of international competitors, or the top 50, whichever was fewer. Edwards would never again compete at an Olympic Games.

Gradually and inevitably Edwards' star began to fade. He continued ski jumping in Europe and, by

1998, Edwards was reported to be jumping distances of 85m and 115m on the 90m and 120m jumps respectively, but he would never again make the Olympics. By 1992 things had taken a sour turn, as Edwards entered involuntary bankruptcy, unable to pay a tax bill due to his trust fund being managed poorly; Edwards would subsequently settle out of court against his trustees and get some of his money back.

A return to building suggested a fall from grace for the Eagle, but the after-dinner speaking circuit and motivational lectures still kept the money coming in. He even sold film rights for his life story - it's still in the pipeline - and was a torchbearer in Winnipeg, as part of the relay as the Olympic flame made its way to Vancouver for the 2010 Games.

So, on which side of the fence do you sit? Was he a no-hoper who made a mockery of international sport, or a plucky underdog who captivated the world through his bravery and determination to fulfil his dream? Personally, I agree with David Miller, who wrote that competitors such as Edwards "have a place in the Games, but not in the newspapers". Surely everyone has the right to represent their nation in the Olympics, although the level of celebrity afforded to Edwards was a little over the top. At the time, I loved it though, probably because I was a 12-year-old boy who was not yet cynical enough to criticise.

Those who still mock Edwards - and there were plenty who did so at the time - should consider the sacrifices he made to get to Calgary in 1988, the bravery needed to take yourself to the top of any ski jump and propel yourself off it at speeds of 50mph.

The celebration of his poor performance was not ideal, and being famous for not being very good at something is a problem that still persists in this country today, but who among us would have turned down the chance of fame that came after all that Edwards had put himself through? Who could have knocked the money back after years on the breadline? It is easy to moan about Eddie and laugh at him, but from purely a sporting point of view, he deserves a lot of praise for making his Calgary dream a reality.

The Bridge's Kim Bodnia: 'Darkness, misery, evil – we do them best'

The Bridge 2 ends on Saturday, having rekindled our passion for all things Nordic. Kim Bodnia, one half of TV's oddest cop couple, tries to get his head round the show's runaway success

By Stuart Jeffries

On Saturday night, an estimated one million Britons will sit down for two hours to watch the finale of a 10-part cop drama, *The Bridge*, filmed in two languages (Swedish and Danish) that they've never even aspired to understand, still less speak.

Many more will have set their hard drives, and will struggle to get through the weekend trying not to learn how TV's most diverting odd couple, Malmö detective Saga Norén and her Copenhagen counterpart Martin Rohde, will solve the case of the eco-terrorists who've been poisoning their blameless citizens with pneumonic plague virus.

What's going on? Surely the Scandi-drama cupboard is bare, having been raided so many times in recent years by BBC4 commissioning editors desperate to fill that 9pm Saturday night Euro-drama slot?

Kim Bodnia, who plays Martin Rohde, giggles as I ask him these questions when we meet in the Sanderson hotel in London. "Insane, right? Us Danes are from such a little country – there are just four million of us. But I guess we have something to offer, something you don't have enough of." Time was when that was just bacon and Lego, but no longer.

"Right! But for me this is incredible. What the hell am I doing here?" He throws off his sheepskin coat and sits surveying the pretentious lobby as though he's a hayseed taking in Times Square. "I never expected this. To be invited here by you guys! Wow! We looked to you. Now? You look to us? Incredible, dude!" A gentle bear of a man, Bodnia speaks English with an American accent that he picked up recently in New York, where he was directing *The Tailor's Tale*, Bodin Saphir's play about his Jewish grandfather's life in Copenhagen during Nazi occupation.

Who is Kim Bodnia? "I'm half-Russian, half-Polish and all Jewish. At 14 I was the fastest runner in Denmark. I was nearly a professional goalkeeper. I could have been the rival of Peter Schmeichel." Good: football's loss is Danish culture's gain.

Bodnia is one of a roster of Swedish and Danish actors, directors, writers and chefs who've been brought over for this weekend's Nordica 2014 festival in London. It's there that Scandi fetishists can meet Sidse Babett Knudsen, the Dane who played the statsminister in *Borgen*; there too you'll be able

to pay homage to Krister Henriksson, the Swede who was Kurt Wallander long before it occurred to Kenneth Branagh he could play an English-language version of Henning Mankell's hangdog Ystad detective, and take part in the great Scandinavian cinnamon bun bake-off.

At Nordica, you can attend demonstrations of other Scandinavian cuisine, watch trailers about upcoming Nordic noir movies – you can even look at the iconic Porsche that Saga Norén drives in *The Bridge*. They missed one trick, though: if Lego had produced a commemorative scale model of the superb Øresund Bridge that lends its name to the Swedish-Danish crime series that ends Saturday, then Nordica would be the perfect tribute to Britain's strange, enduring love for Scandinavia.

But what's this all about? Aren't we done with Scandinavia yet, with its sensible cars, minimalist design, self-assembly furniture, crime thrillers, witty Radio 4 presenter, and Norwegian formula hand cream? It's been three long years since British TV viewers fell in love with Nordic noir thanks to Sophie Gråbøl's Sarah Lund, the marvellously lugubrious Danish detective with a pony-tail tied with an elastic band and her non-designer wellies. It's three years, too, since Gråbøl told me as we strolled through Copenhagen that she played Lund as a traditional male detective – she walked, talked and emoted like a man, and had authority issues usually reserved for maverick males. Britain adored her.

But today? If you're knitting one of Lund's once fashion-forward Faroe Island sweaters in 2014, you can only be doing so ironically. Denmark in particular, and Scandinavia generally, are so 2011, aren't they?

Apparently not. We're still watching the Scandinavian detectives. Why? Here are two theories, each of them put to me by a Dane this week. Kasper Holsten, director of opera at Covent Garden, reckons it's because Scandinavians are doing what British TV drama used to do. "What's happened is that the makers of [British] TV drama are looking to America and not doing what they used to do so well. That's left a gap for Danish and Swedish TV to do what you used to do – take your time, develop characters and stories."

It's a common theory. *The Killing's* head writer, Søren Sveistrup, said as much when he told me that the great virtue of British audiences liking Danish TV dramas was that it was a bulwark against cultural imperialism from the other side of the Atlantic. "Otherwise," said Sveistrup, "especially for the UK, everything becomes Americanised." What's espe-

cially intriguing about Scandi successes such as *The Killing* and *The Bridge* is that British TV audiences, usually monoglot and subtitle-averse, have embraced the originals much more than the inevitable US remakes. We like *The Killing* in Copenhagen rather than its Seattle-set simulacrum, thanks very much. (That said, only a fool would prefer the Swedish movie of Stieg Larsson's *The Girl With the Dragon Tattoo* over David Fincher's English-language version).

"I don't believe that you guys have become more American in drama," counters Kim Bodnia. "The idea that you guys have lost the plot in TV drama is wrong." He has a different theory of the appeal of shows such as *The Bridge*. What is it? "We are caught up in the darkness. We are caught up in the paranoid shit. The darkness, the evil and the misery – we just do those best." Even though Bodnia, 48, is one of the most genial interviewees I've encountered, as he sets out this theory he sounds like a cross between Kierkegaard and Ingmar Bergman.

But surely you can't be right about that. Isn't Denmark regularly voted the happiest country in Europe? "It is, but you wouldn't guess that from our film or TV." True. Ever since Dogme 95 movies such as Thomas Vinterberg's *Festen* or Lars von Trier's *The Idiots* – and let's not forget Lukas Moodysson's Swedish-Danish *Lilya 4-ever* – Danish film has been not just one of the most engrossing national cinemas, but unremittingly, cherishably bleak. And Bodnia in his early days as an actor was part of this Nordic noir movement: he first starred in fellow Dane Nicolas Winding Refn's *Pusher*, playing a heroin dealer. "I was always good at playing evil bastards – that was my speciality, professionally, until I became Martin Rohde. The Swedes got there first – their dramas were always the darkest and most upsetting, and we used to love them when I was growing up in Denmark. Now us Danes have caught up."

This chimes with a proposition that will be tested on Sunday at London's adult education centre, City Lit, during a day-long course called *Nordic Noir*. The course aims to explore the idea that the popularity of recent Danish and Swedish crime films, including the adaptations of Larsson's *Millennium* trilogy, can be traced back to Ingmar Bergman's 1962 film *Winter Light*, which dramatised the Swede's existential crisis.

Here's a third theory. Yes, we may have had enough of Scandinavia. But season two of *The Bridge* has blindsided us, reigniting our Scandi ardour (following the rather limp third series of Copenhagen's answer to *The West Wing*, *Borgen*,



'I guess we have something to offer, something you don't have enough of' ... Danish actor Kim Bodnia, aka Martin Rohde in *The Bridge*. Photograph: Linda Nyland for the Guardian

that finished on BBC4 just before Christmas). And the reason it's been so compelling is not so much to do with the whodunit, but rather the relationship between Bodnia's Rohde and Sofia Helin's Norén. Yes there have been odd couples in crime dramas before (Morse and Lewis, Holmes and Watson, Clouseau and Cato, not to mention Matthew McConaughey and Woody Harrelson in HBO's marvelous new series *True Detective*), but none so fruitful as these two. Norén is a cop with Asperger's (even though that word never appears in the script) and so emotes very little, but solves crimes with devastating deductive skills. She takes the inversion of gender roles one step further than Sarah Lund: sure, she effectively plays the traditional male role (though she's much more rule-bound than Lund) and is equally affectless, but she confers on her male co-worker the traditional female attributes seen in detective dramas.

It's left to Bodnia's Martin to follow Saga's lead, to say little but silently express much, to yearn for his partner to express her feelings. What's it like to play the woman's role? Bodnia laughs obligingly. "I like it! We men we are so sensitive and we have been placed in a bad role. It's unfair that we're shown without tears, without feelings. My job is to change that stereotype."

Thankfully, there's more to Martin than a good man in touch with his feelings or reverser of gender stereotypes: in the finale, in one of those wrong-footing plot twists *The Bridge* does so well, we will learn that Martin has a dark, shameful secret that will stretch his and Saga's relationship to its limits. Yay! Otherwise, you'd think, he wouldn't really be Danish.

But Bodnia's character is not endlessly mutable. There is never any question of Saga and Martin, for instance, despite his libidinousness and her love of sex, having an affair. "That would be wrong. For me, Saga is my daughter. In Norway they really want them to get together. I'm like, 'Guys, what does that say about Norway if men want to have a relationship with their daughters.' Really, though, I love Norway."

Bodnia doesn't balk when I suggest that Martin is the best role of his career, but for now he's concentrating on others. We will see him next opposite Jennifer Lawrence and Bradley Cooper in *Serena*, playing a hard man who gets rubbed out in the first reel. More intriguing is his most improbable role yet - an Iranian interrogator in the much-anticipated directorial debut by Jon Stewart, host of *The Daily Show*.

The film is based on the 2011 memoir, *Then They Came for Me*, by London-based Iranian journalist Maziar Bahari who went to cover Iran's 2009 presidential elections but wound up spending three months in the country's most notorious prison. There, Bahari was interrogated by a man he recognised only by his sense of smell - hence the film's title, *Rosewater*.

The interrogator is played by Bodnia, Bahari by Gael García Bernal. "It was a tough job because I'm Jewish. I'm playing a guy who really hates me and wants to destroy my country."

How did Bodnia get the part? "Jon called me up and said: 'You're the guy I need.'" But why would Jon Stewart, great satirist though he is, be making this movie? "I think Jon feels a little guilty for what happened to the journalist. You see, Bahari appeared on the *Daily Show* and did this routine in which he and Jon pretended he was a spy. The Iranians took it as evidence that Bahari really was a spy. So he goes to Iran and gets arrested and treated as a spy. So Jon thinks it's partly his fault."

Bodnia shot the film with Stewart in Jordan and the US. As they filmed, Iranian state TV denounced the project, contending that Stewart was a Zionist CIA spy making a propaganda movie. "Jon has been directing an ultra-formulaic movie commissioned by his masters," argued the Iranian TV report.

Enough about Iranian interrogators. Bodnia is looking forward to season three of *The Bridge*, which is currently being written. But hold on. Surely there's something that happens in the season two finale that precludes your appearance? "You think? Oh no, I'm going to be in season three. Trust me, dude. I'm not done with Martin Rohde yet."

Kim Bodnia appears at the Nordicana festival at The Old Truman Brewery, London E1, 1-2 Feb. The Bridge concludes on Saturday 1 Feb at 9pm on BBC Four. The DVD box set is released on Monday 3 Feb.

Metronomy's Joseph Mount: 'I wouldn't want to be like Coldplay'

Love Letters, Metronomy's fourth album, could see the band hit the big time. But singer Joseph Mount reckons success is the last thing on his mind
By Alexis Petridis

In a vegetarian restaurant in Brighton, Metronomy's Joseph Mount is telling me about the moment he first became aware of his own mortality. A little unexpectedly, his first contemplation of death involved the Bradford-based one-hit wonder and winner of the 1993 Brit for best newcomer, Tasmin Archer. "I really remember it," he says, "I was 10 years old, watching Top of the Pops. The video for Sleeping Satellite came on and there's a bit in it where Tasmin Archer is spinning around, with stars falling down and I remember watching it and suddenly being aware that I was going to die. As a 10-year-old! Oh my God!"

Hang on, why?

"I've got no idea," he says. "I listened to it again quite recently, and there's absolutely no reason why that record should make anyone consider their own mortality. But ever since then, in the same way that What's Up by 4 Non Blondes reminds me of going on holiday with my family to Cornwall, Tasmin Archer sort of signifies death."

And so Archer found her way into the lyrics of Metronomy's fourth album, Love Letters, a record that carries a certain degree of expectation. Their last release, 2011's The English Riviera, went gold, was nominated for a Mercury Prize and appears to have been credited by the Devon Tourist Board with increasing public interest in the titular holiday destination. "You imagine they've got their Google Alerts coming in to the office at the tourist board, and when we get nominated for the Mercury, suddenly their Google Alerts light up: 'What the fuck's happening? Why is everyone talking about us?'" says Mount, who was born in Totnes. "Anyway, the payoff was that when we did a video in Torquay the council were sort of giddy with excitement to help

us out, closing off roads and stuff."

Reading on mobile? Watch Metronomy's video for I'm Aquarius here

People think Love Letters is going to be a big hit but Mount seems blithely indifferent to its commercial chances. On the one hand, he notes, Metronomy played some US arena gigs supporting Coldplay, which came as something of a surprise, given that Mount had publicly expressed his dislike of Coldplay's music ("I think we have to appreciate that Chris and the boys, they've got bigger fish to fry than trawling through our old interviews," he says now), but nevertheless gave Mount an opportunity to watch one of the biggest bands in the world up close.

He thinks there are "moments in the new songs that could accidentally turn into rousing stadium moments, although that was the furthest thing from my mind when I was doing them". On the other, as he points out, "if there had been traditional music industry pressure to make a big followup, I would have gone into a big studio with [U2 producer] Flood and spent a lot of money recording a very polished kind of radio album, and I did the exact opposite of that."

Instead, Metronomy decamped to East London's famously retro Toe Rag Studios, famed for turning out garage rock records - not least the White Stripes' Elephant - and whose owner, Liam Watson, seemed initially nonplussed by Mount turning up with synthesisers and drum machines: "He was taking us around sort of saying: 'You're going to hate it here.'"

There are plenty of fantastic songs on Love Letters, but it doesn't sound much like The English Riviera's attempt to imagine a genre of music that had grown up in isolation in Torquay - which turned out to be a very English take on Steely Dan's ultra-slick brand of rock - instead offering something in-

fluenced by psychedelia and Sly Stone's experiments with a primitive drum machine. But then again, Metronomy's fans have presumably got used to Mount taking sudden left turns: you could never accuse him of having stuck doggedly to a musical blueprint.

Metronomy began life as a largely instrumental electronic act ("I was listening to a lot of very up-its-own-arse intelligent dance music that wasn't even intelligent and wasn't really dance music, but I decided I was going to be a nerd about it"), before being lumped in with the Klaxons as part of the short-lived east London "nu rave" scene. "There was this thing in 2006 called Tales of the Jackalope, which was a festival Vice did, a bit like ..." - he lets out a snort of laughter - "a kind of Woodstock for the nu rave generation. We played, Klaxons played, the Horrors played - great nu rave band, there - Justice were supposed to play. It was in this field in a penned-off area, so you could see the perimeter, and inside of the perimeter there was maybe 50 people sitting around and that's as busy as it got."

By then, Metronomy had developed their own stage show, involving synchronised dancing and clothes decorated with flashing LED lights. "We literally weren't doing that much on stage, we weren't playing much, there was just a computer. So we just thought, let's try and be entertaining. And then another part of it was, in a very budget way, imagining that we were carrying on the tradition that Kraftwerk began: visual, electronic music. Like Daft Punk, Human League in a way, being a bit like, not pretentious, but imagining that you're kind of presenting a spectacle. And then, weirdly, we became a bit popular. By that point, it was too late to do anything about what we'd begun, so we were kind of stuck in this, it's not really kind of what we're about, but whatever. I really fluctuate between feeling kind of embarrassed by it, in a way, and feeling like I wish we'd continued it. Because now we're



Metronomy, from left, Joseph Mount, Anna Prior, Gbenga Adelekan and Oscar Cash Photograph: PR company handout

playing everything, we don't really have the time to do any of it."

I ask him if there's anything that appealed to him about Coldplay's level of success and he looks mortified. "No! When I started playing drums and I joined a band, the first band I was in when I was 14, that's exactly what I imagined, that was my dream. It could have happened, too. I kind of tell people about that band and they don't really understand how good it was. We were called the Upsides. The demos we made were phenomenal, really professional, not like a school band at all, we had managers coming down to Devon to see us. And then one of the singers decided to move to Liverpool with his girlfriend and it all fell apart. That would have been like a group of schoolfriends getting in a band together, taking on the world, it could have been like that. But it was so brilliant, to try and find that again just seemed crazy. I've got no interest in it happening now."

He says he always thinks every Metronomy album is going to be their last. "I imagine that one day I will stop doing this and be a producer, I can see that. But with every record, I'm always surprised by the reality of the situation. With every record, I'm so surprised by how viable being a musician is, that I'm like, well, I can put off this idea that I have to become a producer."

But then, he says, Metronomy's recent success has caused him to revise that kind of thinking. "Yeah, I now think I've probably got two more albums left in me," he smiles. "We'll see."

How to bake the perfect soda bread

Is soda bread the world's easiest loaf, do you like it brown or white, and what do you eat with it beyond butter or honey?

By Felicity Cloake

A wiser woman than me (Elizabeth David) once wrote that "everyone who cooks, in however limited a way, should know how to make a loaf of soda bread" - and, as with so much else in life (apart from spaghetti alle vongole), she's right. Even if you live next door to the world's best artisan bakery, or you're quite content with your supermarket sliced, there is no denying the satisfaction of a loaf that can be in the oven in less time than it takes to brew a pot of tea, and is ready to eat by the time you get out of the shower.

The first time I saw soda bread made - at Pierce and Valerie McAuliffe's cookery school in the grounds of Dunbrody Abbey, County Wexford - I was astonished that bread could be so easy. No need for proving or kneading - the simplicity of these chemically raised breads made them popular throughout the British Isles in the late 19th century, but they were particularly embraced in rural Ireland, where available equipment tended to run to a pot oven and a peat fire.

Ireland remains the heartland of soda bread today. Filling and wholesome, it pops up at almost every meal, and is so universal that the more common wholemeal version is generally known simply as brown or wheaten bread. It goes with everything from salty yellow butter to soup, smoked salmon to soft cheese, and creates very little in the way of washing-up. Seriously, can you afford not to have a recipe for soda bread in your life?

Flour

Soda bread can be made with white or brown flour, although, as David points out in her *English Bread and Yeast Cookery*, there is little point using strong bread flour here: the Irish often talk of a "cake" of

brown bread, which gives you a fair idea of the texture to aim for. Moist and crumbly, rather than light and airy, is the name of the game. I'll be concentrating on the wholemeal variety - white soda bread is nice enough, but you can't beat the dark, dense, almost absurdly wholesome kind.

Patrick Ryan uses 100% wholemeal flour, "the coarser the better", in the book *Bread Revolution*, as does David, and Rose Prince in her *Pocket Bakery* book, with the caveat that it should be "properly grainy". Chef Richard Corrigan uses half wholemeal and half white flour in *The Clatter of Forks and Spoons*, and Darina Allen uses one part white to just over five parts wholemeal in *Forgotten Skills of Cooking*.

It can't be denied that a proportion of plain flour gives a lighter result, but that's not what I'm after here. If you'd like a loaf to eat every day, then by all means swap in half the amount of white flour, but I love the nubby texture and nutty flavour of the wholemeal loaves; they feel ridiculously good for me. Try to get the coarsest ground flour you can; health food shops are often fruitful hunting grounds, or visit the likes of Shipton Mill online.

Prince and Corrigan use rolled oats in their bread, which I'm also a fan of: the more grains the merrier.

Liquid

Buttermilk, the thin liquid runoff from buttermaking, is apparently the traditional liquid ingredient. Most commercially available buttermilk in this country is actually artificially soured milk, and somewhat thicker than the real thing. That said, it works perfectly well for the purpose, which is to react with bicarbonate of soda to kickstart the raising process. Prince suggests you can substitute milk soured with lemon juice, which works in exactly the same way - or if you're feeling really thrifty, soda bread is an ideal final destination for sour milk. (Ryan uses milk and red-wine vinegar, which gives

his bread a little more of a tang, although it's a fine substitute if that's all you've got in the way of acid.)

Ryan and Allen put olive oil in their bread, which I think is supposed to give it a harder crust and a crumblier interior, but it doesn't make much difference. Allen also adds an egg, but I find her bread slightly too light; it could almost pass for a moist yeasted loaf, whereas I want something rather more substantial. Keeping it traditional by just using buttermilk suits me fine.

Bicarbonate of soda

In my experience, one of the things that puts people off soda bread is the bitter tang of bicarbonate of soda, so it's important to get the balance right: just enough to raise the bread, but not enough to taint the flavour. Prince uses the most: two teaspoons per 450g of flour and oats, twice as much as Allen, yet the latter's loaf rises well enough.

Seasoning

Happily (for me, if not my health), the Irish are not shy of salt, but David's two teaspoons are excessive; half the amount does the trick for modern palates. Balancing it with a little sugar is not strictly necessary, and Prince's molasses are a little too tangily assertive for my liking, but I think Corrigan's treacle works wonderfully with the nuttiness of the brown flour. He and Allen both use honey as well, which adds a purer, clearer sweetness (unrefined sugar, as in Ryan's recipe, would work well as a substitute).

Method

Prince kneads her dough lightly for a minute or so, but I'm with Rory O'Connell here: as he cautions in his book *Master It*, "soda breads need only the mini-



Felicity Cloake's perfect soda bread. Photographs: Felicity Cloake for the Guardian

mum amount of handling ... kneading the dough is unnecessary and will actually toughen the bread.” Why bother dirtying a work surface for nothing?

Allen, Prince and Ryan all bake their loaves in a tin, which is perhaps more practical, but I nostalgically prefer the free-form version I first learned to make, slashed into quarters to help it cook all the way through -and, more popularly, to bless the bread. (I can't quite recall the significance of dotting the four quarters - is it something to do with fairies?) The free-form loaf also has the benefit of having more crust - I love the contrast of textures between this and the soft, cakey crumb.

David suggests baking the bread beneath a cake tin, and other recipes use a cast-iron casserole to mimic the traditional pot oven - this is to ensure it "remains moist and [doesn't] form too hard and dry a crust". Corrigan cools it under a damp tea towel for the same reason, which seems to do the trick, but even better is the Cook's Illustrated suggestion of brushing it with melted butter. The more butter the better, after all.

until well mixed, then pour this into the well and, very quickly, stir together with your hands until you have a soft, sticky dough.

Form this into a round on your baking sheet and cut a deep cross in the dough. Bake for 50 minutes to an hour, keeping an eye on it, until the crust is golden and the loaf sounds hollow when tapped underneath.

Brush with melted butter and leave to cool before tearing into it. Eat as soon as possible, as it doesn't keep very well.

Is soda bread the world's easiest bread, or do you have another speedy favourite? Do you like it brown and wholesome or fruity, white and sweet? And, now I've got a glut, what do you do it with it once you've gorged yourself on butter and honey?

The perfect soda bread

(Makes 1 loaf)

450g coarse wholemeal flour

50g rolled oats

1 tsp salt

1 level tsp bicarbonate of soda

1 tbsp treacle

1 tbsp honey

450ml buttermilk (or sour milk, or milk with 1 tbsp lemon juice)

1 tbsp melted butter, to finish

Preheat the oven to 200C/400F/gas mark 6 and grease a baking sheet.

Once the oven has come to temperature, put all the dry ingredient into a large mixing bowl and whisk together to combine. Make a well in the middle. Stir the treacle and honey into the buttermilk

Nigel Slater's tart

recipes



Total meltdown: Nigel Slater's raclette tart recipe. Photograph: Jonathan Lovekin/Ometime

Based on traditional alpine dishes, Nigel's artichoke tartiflette and raclette tart will keep the winter chill at bay - and remind you just how good simple food can be

By Nigel Slater

This old house is quite draughty and cold, so on each dark, bone-chilling night dinner takes on a new significance. Not just a hot dinner to fatten and fill, but something that will warm our very souls.

That alpine dish of tartiflette, whose layers of potatoes, onions, smoked bacon and reblochon cheese helps to thaw out skiers and snowboarders alike after a day on the slopes, is possibly the most warming dish ever invented. I have never found a recipe that does its job quite so successfully. I increase the amount of cheese according to how cold the weather is. Traditionally the dish is all about reblochon, whose pale milky curds melt into a velvety blanket, and whose flavour softens upon heating, but other good melting cheeses can be added, too. Just don't tell the purists and pedants.

This year I swapped half the potatoes in my tartiflette for Jerusalem artichokes, a winter favourite in my kitchen. The artichokes added a break from the mounds of potato - a welcome earthiness and another way to use these under-valued tubers.

Another cheese that gets its place in the sun at this time of year is raclette. I find the original idea of setting a whole cheese in the open hearth, then, as it melts, scraping the softening cheese on to bread, a notion almost too delicious to contemplate. The modern version, where raclette cheese is left to melt over hot potatoes, is a reminder of just how good simple food can be. Once you add a few accompaniments in the shape of knobbly little cornichons and a slice or two cut from a decent salami then you have a fine dinner indeed.

This week, with that warming dinner in mind, I knocked up a slim, crisp tart, complete with a scattering of sliced cornichons, shredded salami and a few hot, soft green peppercorns. Brought to the table with a bowl of crisp and spiky salad, it kept out the cold for yet another winter's night.

Raclette tart

You will need a shallow tart tin with a removable base, about 22cm in diameter.

Serves 6

For the pastry:

plain flour 200g

butter 100g

egg 1 yolk

milk a little

For the filling:

raclette 350g, thinly sliced

salami 50g thinly sliced or shredded

green peppercorns 2 tsp

cornichons 12

eggs 2 yolks

crème fraîche 200ml

thyme leaves a good pinch

Make the pastry first. Put the flour in a large mixing bowl with a pinch of salt. Cut the butter, rub it in with your fingertips until the mixture resembles soft fresh breadcrumbs (a matter of seconds in a food processor). Add the egg yolk, mix a little more then add enough milk - a couple of tablespoons - to bring the dough to a soft, rollable consistency.

Using a little flour on a wooden board, roll the pastry out and use it to line a 22cm shallow-sided tart tin - preferably one with a removable base. Line with baking parchment or greaseproof paper and fill with baking beans. Set aside for 20 minutes in the fridge to rest. This will stop it shrinking during baking. Set the oven at 200C/gas mark 6 and place a metal baking sheet in the oven.

When the pastry case has rested, bake on the hot baking sheet for 20 minutes. Remove the case from the oven, carefully lift out the paper and baking beans, then return to the oven for 5 minutes, until dry to the touch. Lower the heat to 180C/gas mark 4.

For the filling, put the egg yolks in a mixing bowl, then stir in the crème fraîche and a little salt and black pepper. Slice the cornichons in half lengthways, shred the salami, rinse the green peppercorns and chop the thyme leaves.

Place the slices of cheese neatly in the base of the tart case. Scatter over the shredded salami, green

peppercorns and cornichons, then pour over the crème fraîche and egg mixture. Carefully carry it to the oven, place on the heated tray, and bake for 25-30 minutes until the filling is lightly set and pale gold. Leave to cool a little before serving.

Artichoke 'tartiflette'

If you want a deeply cheese-laden, uber-warming version, then you could add more cheese and crème fraîche - about half as much again - but this is quite enough for me. A crisp salad involving frisée, watercress and perhaps Belgian chicory would be just the thing with which to mop your plate.

Serves 4

floury potatoes 600g

Jerusalem artichokes 400g

smoked lardons or pancetta 250g

olive oil a little

red onions 2, sliced

crème fraîche 300ml

reblochon 350g

parmesan a little (optional)

Peel the potatoes and artichokes then steam or boil them in deep, salted water until tender. They take roughly the same time, so you can cook them together. Drain and cut each one into thick slices. Don't worry if they crumble a little. Cut the pancetta into short, thick pieces. Heat the oven to 180C/gas mark 4.

Warm the olive oil in a shallow pan, add the lardons or pancetta and cook over a moderate heat with the occasional stir, until the fat is golden. Transfer the pancetta to a plate, leaving behind the oil and fat. Peel the onions, then slice thickly. Add them to the oil and pancetta fat and cook for 10 minutes, until pale gold and soft.

Put the sliced potatoes and artichokes in the pan with the softened onions, and continue cooking for 3 or 4 minutes, shaking the pan occasionally, until they have coloured lightly here and there. Stir in the cooked pancetta.

Cut the reblochon into thick slices. Spoon a layer of the potato, onion and bacon into a dish, add a few slices of reblochon then more potato mixture. Finish with spoonfuls of the crème fraîche and, if you wish, a fine grating of parmesan.

Bake the tartiflette for about 40 minutes until bubbling.

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