UNIVERSITY OF CAMBRIDGE

Cambridge Alumni Magazine
Issue 94 – Michaelmas Term 2021

CAM

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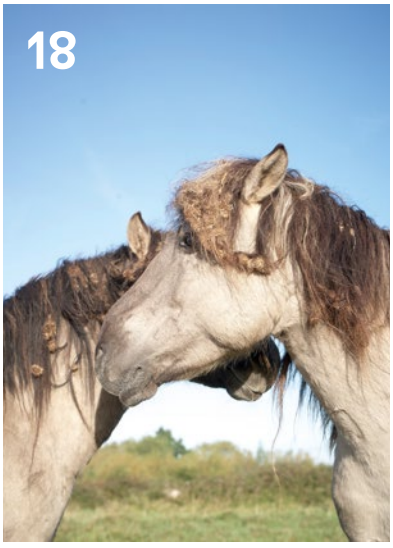
Cambridge Alumni Magazine

Michaelmas Term 2021

Issue 94



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Cover
Julian Anderson

CAM is published three times a year, in the Lent, Easter and Michaelmas terms, and is sent free to Cambridge alumni. It is available to non-alumni on subscription. For further information please email contact@alumni.cam.ac.uk.

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Editor's Letter

Welcome to Michaelmas Term CAM – and a special edition focused on finding solutions to the climate emergency.

Rapid transition is possible. Complicated? Yes. Requiring both political and individual action? Of course. Net zero is not the end game. But it is possible – we can make change and it will work.

How? In these pages, CAM sets out to uncover how academics and students across Cambridge are addressing the key issues, from what we need to do now to make rapid transition a reality (page 24) to landscape generation (page 18). We examine the work of Cambridge scientists, engineers and architects as they create sustainable materials (page 36) and highlight the efforts of Cambridge alumni as they work around the world to renew the planet (page 13).

The actions of the next 10 years will determine what our planet will look like at the end of the 21st century. This issue of CAM is just a snapshot of the work being done in Cambridge now to understand, ameliorate and shape that reality. To find out more about the work taking place in all departments, from Physics to Anthropology, please visit zero.cam.ac.uk.

And meanwhile, on these topics – and on all things Cambridge related – we look forward to your contribution to the debate: online at magazine.alumni.cam.ac.uk, by post, email or on social media.

Mira Katbamna
(Caius 1995)

CAM online

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magazine.alumni.cam.ac.uk

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PHOTOGRAPHY: CAMILLA GREENWELL

Outbox

What are your wishes for a green future? We asked University experts to tell us the changes that will make the most difference in their area of research.

My wish is that those of us in wealthy countries will consider how difficult the energy transition will be for many parts of the global South. Access to any form of reliable energy is unequally distributed. Rather than simply preaching about the risks we all face, we need to work hard both on financing for energy distribution and on technical innovations that are relevant to the vast majority of the world's population.
Professor Stephen J Toope
Vice-Chancellor

Evidence shows that some actions for, say, reversing deforestation or reducing methane are effective: others are not. Without building on previous experience, using the scientific literature and establishing processes for adaptive learning, it is likely that eye-watering expenditure will be squandered.
Professor William Sutherland
Department of Zoology

Focus on solving 80 per cent of the problem in 20 per cent of the time... 'perfect' is the enemy of 'good' here. Forget about *dunkelflaute*: it doesn't make the 80:20 cut. Electrify everything possible immediately. Stop fugitive methane. Develop international agreement on deployment of precious biofuels in the most difficult to abate sectors.
Professor David Cebon
Department of Engineering

In 2009, at COP15, countries pledged that by 2020, $100 billion a year would finance projects to reduce emissions or adapt to climate impacts. More broadly, trillions will be needed on clean energy infrastructure. Both objectives are off-track, so COP26 offers a chance to show climate action is more than just rhetoric.
Dr David Reiner
Cambridge Judge Business School

Biodiversity is critical to global sustainability, necessary for healthy lives, wellbeing, food and ecosystems. Biodiversity includes humans, and the most biodiverse areas are home to tribal peoples. Protection of tribal peoples' lands rights will effectively sustain them; stop colonial conservation removing people from land.
Professor James Wood
Department of Veterinary Medicine

As the climate heats up, we must decarbonise the built environment, especially for those living informally. Data-driven design for a built environment can critically generate contextualized net-zero solutions by integrating the hard data on changing climate with the soft collective intelligence about people, places and practices.
Dr Ronita Bardhan
Department of Architecture

A global shift is needed in what we consider 'progress' to align environment, population health and economics. My own personal field of research is ageing, and I would like to see a societal life course approach to improving healthy lives as we age, in a sustainable and equitable manner.
Professor Carol Brayne
Cambridge Public Health

Avoid knee-jerk reactions to tackle a single issue: the environment is a complex interrelated system. The 'no plastic' movement is far too simplistic. Appropriate plastic food packaging saves huge amounts of food wastage. Longer-term, stop single-use anything (not just plastics), capture end-of-life plastic and recycle effectively into high-quality new material.
Dr Claire Barlow
Department of Engineering

Rethink technologies from a sustainability and ease of recycling/reuse perspective; be more upfront and realistic about the fundamental limits of different technologies; and ensure that research attacks both short- and longer-term goals, with funding timescales that match the challenges.
Professor Clare Grey
Yusuf Hamied Department of Chemistry

My hope is that the world's centres of legal and governance education, and the most dedicated law, public policy and other students, can help to bridge the 'capacity chasm' that is gaping in our path ahead, to advance implementation and compliance with climate change commitments towards sustainability on all levels.
Professor Marie-Claire Cordonier Segger, Lauterpacht Centre for International Law

After two decades of underinvestment, declining productivity and mounting climate and ecological risks, there is now an opportunity for a globally coordinated response towards investing in future-proofed sustainable assets, contributing to a sustainable and resilient recovery and transition to net zero emissions.
Dimitri Zenghelis
Bennett Institute for Public Policy

ILLUSTRATION: MICHAEL KIRKHAM

Scholarships

30 new Stormzy Scholarships for Black students, funded by the #Merky Foundation and HSBC UK

cam.ac.uk/stormzy-scholarships-expanded

Annual Address

Vice-Chancellor calls for international engagement with "eyes wide open"

Vice-Chancellor Stephen Toope's final address to the University noted that "the tectonic plates of geopolitics have shifted significantly" and said that the University's new set of principles for managing risks in international engagement will "allow us to continue to work on vital research with partners across the world, taking careful regard of risks".

"We must build ways to work with partners in nations that do not conform to Western norms and values, while protecting our own principles and standards," he said, arguing that change is made through engagement, not isolation. This is not a time to retreat into national pockets of academia, he said, but to "turn our attention to what we do best – seeking solutions to intractable problems by working with partners around the globe".

Speaking to a small in-person audience at Senate House, with many more watching remotely, Toope also paid tribute to the continuing "resolve, resourcefulness and resilience" of the Covid-19 response. He highlighted other notable achievements, from Shankar Balasubramanian and David Klenerman winning the Millennium Technology Prize for their work on next-generation DNA sequencing, to the Men's and Women's rowing crews' clean sweep at the 2021 Boat Race.

The University's commitment to widening access, he said, "remains unstoppable", and remains a top priority. And discussing Cambridge's "proud history of upholding freedom of speech", Toope said: "It is our duty, as a collegiate community, to nurture a culture of discussion and debate, not a culture of cancelling and calling out."

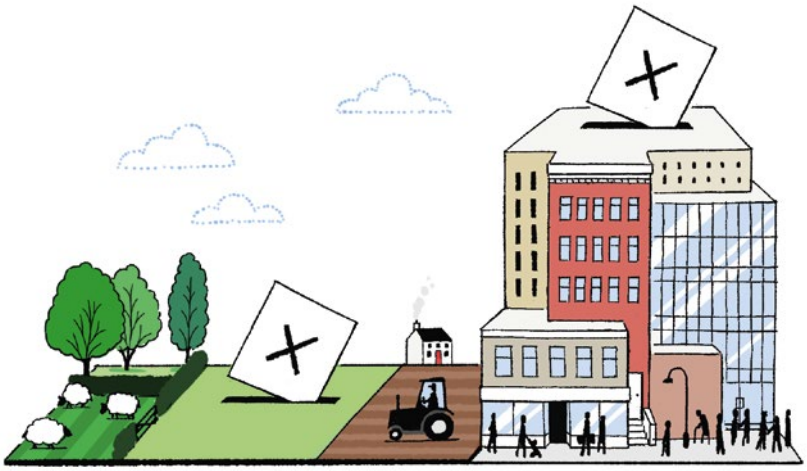
Toope, who recently announced he will leave his post in September 2022, said that he still had much to do, and closed with a Robert Frost quote: "But I have promises to keep/And miles to go before I sleep."

PHOTOGRAPHY: NICK SAFFELL

STEM SMART pilot for A-Level students

Hundreds of UK STEM students will benefit from enhanced learning and mentoring delivered by academics and students, thanks to a new widening participation initiative from the University. The 17-month STEM SMART programme aims to support talented maths and science A-Level state school students during their final 18 months at school.

cam.ac.uk/stem-smart-pilot

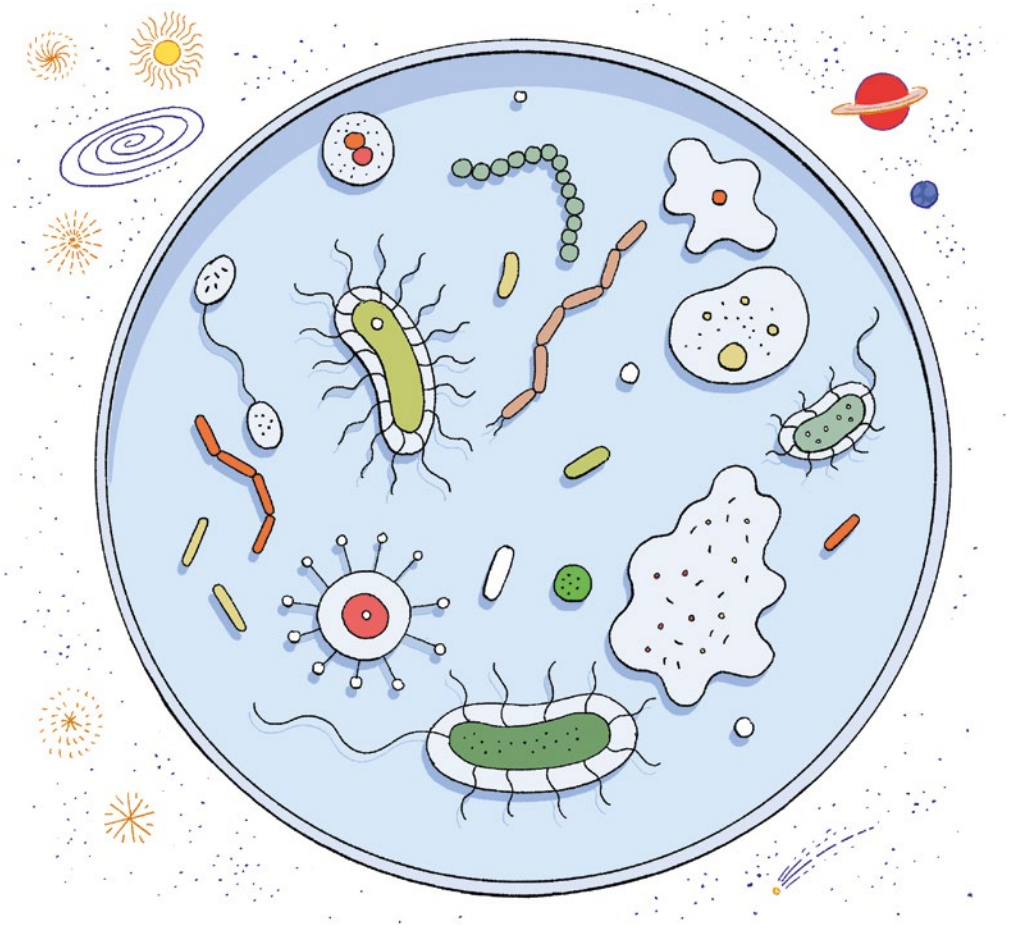


Deconstructed

New class of habitable exoplanets a big step forward in the search for life

Astronomers searching for life outside our solar systems have traditionally sought out Earth-like planets of similar size, mass, temperature and atmospheric composition to Earth.

Cambridge researchers, led by Professor Nikku Madhusudhan, have identified a new class of 'Hycean' planets: habitable, ocean-covered planets with hydrogen-rich atmospheres.



They also allow for a far wider habitable 'Goldilocks zone', compared to Earth-like planets, so could support life in ways and in places that an Earth-like planet could not.

Hycean planets are bigger and hotter than Earth and could host large oceans, which may support the kinds of microbial life which are found in Earth's extreme aquatic environments.

ILLUSTRATION: MICHAEL KIRKHAM

Three-minute Tripos

EUROPE-WIDE POLITICAL DIVIDE EMERGING BETWEEN CITIES AND COUNTRYSIDE. DISCUSS.

Ah, the countryside. The fresh air! The rolling vistas!

The disenchantment! The distrust in democracy! The division! The weather!

Oh, come now. As the wise old rural saying goes: rain before seven, fine before eleven. And that cottage has an actual thatched roof.

Yet beneath that chocolate-box exterior lies a deepening geographical fracture that could herald a return to the stark urban-rural political divides of the early 20th century.

Says who? That kindly old gardener with the basket of apples?

Say researchers from Cambridge's Bennett Institute for Public Policy and Department of Land Economy.

They analysed survey data collected between 2002 and 2018, gauging the social civic attitudes of people across the cities, towns and rural areas of 30 European countries – the EU 27, Norway, Switzerland and the UK. Also, don't be fooled by rural stereotypes. That gardener is probably a CEO.

And what did the researchers unearth?

They found that political division throughout Europe runs on a 'gradient' of disenchantment and distrust in democracy – lower levels of distrust in urban centres rising through suburbs, towns and villages, and highest in the open country.

Such a shame we all can't just get along.

Well, perhaps we still can. While there's a big urban-rural divide around some issues – attitudes to immigration and the EU, for example – the study also found very few divisions over issues concerning the welfare state and attitudes to police, both hugely contentious in the post-war years. Here's another wise saying: hope springs eternal.

cam.ac.uk/geography-of-disillusion

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CAMBRIDGE
— CLUB —

Welcome to your Club

For nearly 200 years alumni have chosen to take up membership of a spacious and elegant private club in the heart of London. The Oxford and Cambridge Club in Pall Mall is the perfect place to meet for a drink, entertain friends and colleagues in magnificent surroundings, play squash, take a break, host a party or just find a quiet corner to prepare for a meeting. A thriving social scene, sports facilities, a lively calendar of events including talks, tastings, dinners and balls, an exceptionally well-stocked library, extensive wine cellars and more than 40 bedrooms mean our members use their club for recreation, relaxation and business - and now you can too.

For details on membership or a tour of the Club house on Pall Mall, please visit www.oxfordandcambridgeclub.co.uk or call 020 7321 5103

Oxford and Cambridge Club **@oandcclub**

Left to right: Lisa Kent (Clare 2013) PhD, Medical Sciences; Luisa Deragon (Girton 2016) PhD, Biological Sciences; and Andre Gordilho (Darwin 2015) MFin, Finance.

Hub Life

Cambridge Hub supports pioneering students to develop real-world, practical solutions to climate change.

WORDS **DIANE SHIPLEY** ILLUSTRATION **KATE COPELAND**

Cambridge Hub's ambitions aren't just big, they're global. "Our vision is to be a society where every student gets involved with social and environmental challenges, empowering them to become leaders in sustainability," says the 2020-21 President Megan Lloyd (Lucy Cavendish 2018). Their flagship 12-week Engage for Change programme has so far supported 150 students to design and execute a project of their choice.

For Luisa Deragon (Girton 2016), it all started with Instagram. "Because of the pandemic, everyone switched to disposable containers, and the amount of waste was incredible," she says. "When I saw a post about a company in New York that had replaced single-use food containers with a reusable system, a light bulb went off. I thought, surely we could do something like that at Cambridge?"

Weekly Zoom meetings with her cohort helped to keep her on track as she broke down her plan into actionable steps, from researching manufacturers to approaching Colleges' environmental officers about getting their catering managers on board. "I didn't want them to have to do any extra work; I wanted to present them with a solution that meant they just had to say 'yes'."

Her selling point? Digitally traceable containers integrated in a reusable system that could be used 1,000 times before being recycled, making this the most cost-effective and environmentally friendly option available. She faced challenges along the way, including the difficulty of trying to convince people she couldn't meet in person that this was an important issue. But she turned to her peers on the programme for support. "It helped me feel less alone to know we were all trying to improve the climate crisis."

Deragon's RE.USE scheme launched at Darwin and Girton Colleges in April to what she describes as a "fantastic" response. No wonder, then, that she was awarded the Cambridge Green Impact Special Award in Student Leadership. The goal now is to expand to other Colleges – and beyond.

Thanks to support from Cambridge Judge Business School's Accelerate Cambridge programme, Deragon is now running RE.USE as an early stage startup, with alumni Lisa Kent (Clare 2013) and Andre Gordilho (Darwin 2015) joining as co-founders. They plan to create a city-wide interconnected network of reusable food and drink containers, making it fun, convenient and sustainable for all users through innovative technology.

Although Deragon's science background contributed to her project's success, Engage for Change welcomes students from all disciplines. "We've got people with technical skills and others whose strength is communications," says Lloyd. "There's a wide range of ways to make a difference, which is one of the programme's strengths."

For information about partnership or funding opportunities at the Hub please contact manager@cambridgehub.org. To find out more about RE.USE, please email hello@reuse2go.co.uk.

James Biddulph is Executive Headteacher at University of Cambridge Primary School. He is the co-author with Dr Emily Shuckburgh of *Surviving and Thriving on Planet Earth*, the first in the new Education Visions series of books for teachers.

Children aren't just 'people in waiting' – their voices must be heard now

ILLUSTRATION **KATE COPELAND**

Tom is eleven. He is autistic. He visits my office daily. One Friday he announced, "The problem is the adults are not teaching us how to be better in the world... to deal with climate change and where people could be nicer. What's the point if we can't find out about ourselves?" When the new Children's Commissioner, Dame Rachel de Souza, took up her post in March, she wrote in her first message: "Part of adulthood is having the right answers to big questions. Ultimately, that is what children expect of us – having answers to things."

What troubles me about this statement is that children are seen as passive receivers of adult wisdom. And yet, in reality, children already have a voice and ideas as rich and useful as any adult – perhaps their ideas are even better. Suggesting that they are 'in waiting' until adults figure things out will not solve the critical issues facing humanity; nor will it enable them to have the 'response-*ability*' to create new futures. What we need is more listening and really hearing what they have to say.

The inspiration at the heart of our school comes from the philosopher and teacher, Professor Maxine Greene. As she wrote, "Social imagination is the capacity to invent visions of what should be and what might be in our deficit society, in the streets where we live and our schools. Social imagination not only suggests but also requires that one take action to repair or renew."

In these challenging times, teachers need to look afresh at the children who they teach. We need to reconsider, rethink and reimagine how we teach them to develop the compassionate citizenship to make changes to the world they will inherit. And to do that, we need educational visions which are positive and hopeful and give children a sense of possibility for their lives, rather than outlooks which are increasingly negative and make them think: 'What's the point?'

That's where the concept we call 'future-making prepared' comes in. It's not about saying, 'We're preparing children for the future'. We can't, because we don't know what the future will look like. But we do want them to be unafraid of the future, to have the creative mindsets (or 'possibility thinking') to carve new pathways. We want them primed to come up with new visions and be more inventive in their thinking.

To do this, I believe that we need values at the heart of all we do in education. At our school, we settled on five values or virtues to guide our work: empathy, respect, trust, courage and gratitude – and we explicitly focus on these. For example, if children see the value of treating people with gratitude for their contributions, it makes for a better society and community.

Our children should be 'learners for living'. When the pandemic hit, I read an article that quoted children saying, 'What's the point of education if our exams are going to be cancelled?' It is a worrying state of affairs if children equate education solely with exams. It is clear that they can see that the system is set up for this; a model unchanged for many decades. More and more, the education world is unlocking and in search of keys to help children grow as imaginers, explorers, solvers and committed to be future-makers.

And we need to listen to children and hear what they say. Tom visited me again. It was a Tuesday. He told me about a boy who was cycling to school. The boy's dad told him to just ring the bell over and over again to get people to move out of the way. Tom looked out of my office window and said: "You see, he didn't seem to care about other people – it was all about me, me, me and not we, we, we. Perhaps that's because his dad has never told him that you can't just expect people to get out of your way. You have to wait your turn in life. And perhaps that's why nobody cares about the planet."

Children have a voice already. Asking them to hang around until adults figure things out is not going to solve the issues and problems they are going to face

This was Tom living the values. Here was a child talking about some very profound things in society – community, responsibility and consideration of others. When Professor David Runciman talks about six-year-olds being able to vote, the vast majority say what a ridiculous idea it is. But actually, his arguments are very powerful. If you talk to six-year-olds, they will tell you very clearly the ways of the world as they see it.

We need to build on the work of Professor Neil Mercer, Cambridge's Emeritus Professor of Education, who writes about dialogic teaching – how we get dialogue happening in schools better. The default model is still that the teacher is the repository of all knowledge and teaches the child: the child is the vessel waiting to be filled. But if we can create schools where a true dialogue is happening, then we are saying to children that we value their voices; that they have ideas that are valuable and worth engaging with.

Of course, I am not saying that children should say and do whatever they like: that's a common misconception of giving children agency. Children do not know everything, nor how to behave in pro-social ways – that is one of the points of childhood. But they can contribute to society because they are members of that society and not 'people in waiting'. We must ensure our schools and institutions are set up for these 'voicings' and agency to happen.

Building back better? Levelling up? The new normal? However we brand the need for change, creating a better normal will not be easy: education systems are bound by so many rules, regulations and systemic challenges.

What's the best part of my job? Without doubt, it is listening to children. When I really hear Tom, I can work with colleagues to enable more dialogue, seek more possibilities and enact change. The future is possible. Thanks, Tom.

ILLUSTRATION: MICHAEL KIRKHAM

Dementia research

AI could detect dementia before symptoms appear

AI could detect symptoms of dementia years before symptoms appear with just a simple brain scan, a new study has found.

Professor Zoe Kourtzi and her team at the University, along with the Alan Turing Institute, used brain scans from patients who went on to develop Alzheimer's to create a machine learning algorithm which can spot structural changes in the brain.

Dementias are characterised by these changes: the build-up of different types of protein in the brain, which damages brain tissue and leads to cognitive decline.

They then combined the algorithm with the result from a standard memory test, that provided a 'score' to predict the likelihood of a person having Alzheimer's.

The algorithm was higher than 80 per cent accurate for patients with mild cognitive impairments, such as memory loss or problems with language or visual and spatial perception. It also predicted how fast their cognition would decline.

Eighty patients are now taking part in a real-world trial of the approach, led by Dr Timothy Rittman from the Department of Clinical Neurosciences and a consultant at Addenbrooke's Hospital.

In brief

JANEWAY INSTITUTE

The new Weslie and William Janeway Institute for Economics has launched with a remit to transform economic research. It will be primarily funded by Weslie and William Janeway, an alumnus of the University's PhD programme, and will focus on inequality, climate change, epidemics, gender, the digital economy, the impact of automation and machine learning.

ALUMNI FESTIVAL

Big ideas, groundbreaking research, fascinating experiences: this year's Alumni Festival showcased them all. And now you can experience them too. Many of the sessions are now available as recordings, with more being added in the coming weeks. *cam.ac.uk/2021-alumni-festival*

HAWKING PAPERS

Professor Stephen Hawking's archive has been saved for the nation. His papers and personal objects – from works on theoretical physics to *The Simpsons* scripts – will be divided between the University of Cambridge and the Science Museum. The Hawking archive will be housed at the University Library, along with those of Isaac Newton and Charles Darwin.

From left: Dr Matt Wilkinson (Natural Sciences DoS, Jesus) with students Francesca Toccaceli and Calum McLennan (both King's)

Seed the difference

Why King's has pulled up the turf in favour of a meadow.

WORDS **LUCY JOLIN** PHOTOGRAPHY **LLOYD MANN**

Don't walk on the grass. And we haven't – for 260 years. But now that same grass has been taken over by a riot of poppies, cornflowers, scentless mayflowers, kidney vetch, yellow rattle and corncockles (though still, please don't walk on it). Welcome to King's wildflower meadow.

Why the change? The lawn may have looked lush, but it was in terrible condition, says research fellow Dr Cicely Marshall (Department of Plant Sciences). "It was riddled with the chafer beetle caterpillar that lives under lawns, eating the grass roots. Crows then come along to eat the caterpillars and pull up the turf, leaving big dead patches."

Indeed, Cambridge's sandy, nutrient-poor soil is simply not suitable for lawns, she points out. Maintaining them is a losing battle that requires a vast amount of environmental input – nutrients, water and pesticides. "And it still doesn't work very well," says Marshall.

The original idea came from Geoff Moggridge, Professor in Chemical Engineering Science, whose proposal was guided by the expert knowledge of Marshall and Steven Coghill, King's Head Gardener. Planting began in October 2019, and the meadow has now flowered for two years.

The project has three goals: to increase aesthetic value, combat climate change and reverse wildlife losses. All the world's a research project to a King's research fellow, and Marshall seized the opportunity to observe and record the impact. Plant species have tripled, as more insects and birds come to the meadow and bring more seeds with them. About five times as many insects come to visit than before, which in turn has encouraged five different species of bat, who are 10 times more likely to feed over the meadow than the lawn. And 130 insect species have been recorded so far, including the elephant hawk-moth and the meadow brown butterfly.

About five times as many insects come to visit than before – bringing with them five different species of bat

It's also created an ideal chance for students to study biodiversity in action. Natural Sciences student Calum McLennan (King's Second Year) spent three weeks last summer as an intern for the King's Wildflower Meadow project, recording all the different aspects of biodiversity it attracted – plants, insects, birds, and bats.

"I've particularly enjoyed observing the bats," he says. "One species, the Daubenton's bat, only seems to hunt over the water. While pipistrelles hunt for midges and moths over the meadow, the Daubenton's swoops very low over the water and scoops them up, using membranous flaps to catch them."

As autumn arrives and the days become shorter, the King's community is looking forward to the life and colour next year in the meadow will bring. "There will always be people who prefer a lawn," says Marshall. "But a lot of people think the wildflower meadow is beautiful, too."

When it comes to combating climate change, talk is cheap. Instead, we need leadership, dedication and commitment to get things done.

Which is perhaps why so many Cambridge alumni, from across the world, are working to drive change. Here are the people on the very frontline, and the projects they lead that are making a real difference.

WORDS **SARAH WOODWARD**

Metropolitan Group

Rob Sassor

Conservation Leadership, 2010-2011

Rob Sassor's light bulb moment on climate change came when he was working on a water project for local communities in Tanzania. "I went to a USAID climate meeting and the experts were forecasting that the warmest day in the region today would be the coldest day in just 50 years' time. It just seemed so unfair that a place where the people had so little impact on carbon emissions would become essentially unliveable before the end of this century."

Sassor (Robinson 2010) worked as a researcher and writer for the primatologist Jane Goodall (Newnham 1962) before moving to join her Institute at Gombe in the Kigome District of Tanzania, and from here he learnt the power of narrative. "I ran a successful multi-media campaign against wildfires in Tanzania, created with artists, athletes and educators. I have always been a writer at heart, and my bias is in favour of creating stories to build public and political will."

At the social change agency, Metropolitan Group, part of his role now is to make connections. "To affect change, we need to connect at a deep value level with people who might initially be seen as opponents. For a long time, the narrative around climate change has been getting in the way rather than helping, with the issue still polarised if not paralysed in the context of US domestic policy. On clean energy, we have managed to change the narrative towards global competition and jobs, which has resonated with broader audiences. And now we are seeing some action, with an increasing number of cities and states committed to transitioning to clean energy solutions."

One of Sassor's key connections has been with the NASA Earth Science Division, which manages the most sophisticated monitoring system on ecosystem change and adaptation. "We are helping NASA get their Earth science into the hands of people who can use it to benefit us all. And when NASA is in the room, other groups realise they have to step up – that it's time to innovate and think more holistically about the Earth as a system.

"There are days, at my desk in Washington DC,when I still remember looking out from my computer to see the jungle forest in Gombe. Or walking the land in Sikonge with hydrology experts in search of signs of water. So much of the climate work I do today is inspired by my formative experiences in Tanzania, and the people who ushered me toward this life's work."

We are helping NASA get their Earth science into the hands of people who can use it to benefit us all.

Top

Gombe, Nigeria

The Jane Goodall Institute facilitates democratic forest regeneration, safeguarding watersheds for the benefit of people and chimpanzees.

Rob Sassor / The Jane Goodall Institute

Right

Mtanga village, Tanzania

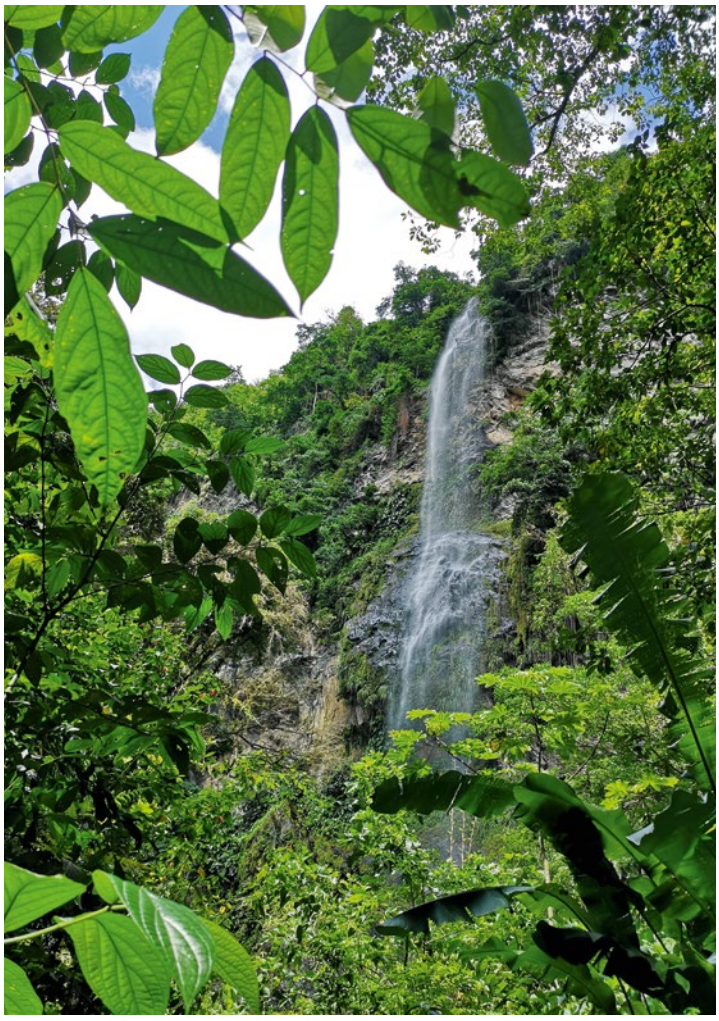
Water is collected from a sediment-laden stream in the aftermath of a landslide which destroyed livelihoods and claimed several lives.

Lilian Pintea / The Jane Goodall Institute

The Cropper Foundation

Omar Mohammed

Sustainability Leadership, 2019-21



Growing up in the Caribbean, Omar Mohammed (Robinson 2019) says he was privileged to spend much of his time in nature. Later, a degree in environmental and natural resource management at the University of the West Indies led to his interest in the human and social side of environmental studies. "Trinidad and Tobago is an outlier in the Caribbean, outside the hurricane belt and only 4km from the coast of South America. The economy is dependent on fossil fuels and energy, and is heavily industrialised. There is incredible biodiversity but a real lack of protection of the environment. Most people aspire to work in the energy sector for the higher salaries."

After working for the national arm of UNESCO (and with several other civil society organisations), Mohammed was attracted to apply for the Master of Studies (MSt) in Sustainability Leadership course by the leadership aspect.

"I felt I needed a course that would help me in my new role as CEO. I looked all over the world and chose Cambridge because of the similarities in the course modules to many of our own ideas in the Caribbean, from natural capital to multi-stakeholder approaches. I was also looking to build a network of others working in the field."

Through his MSt, Mohammed has found that network. "I was the only person on the course from an NGO in a small island state, most of my fellow students were senior corporate professionals from the Global North, but there was a real openness and emotional support and an eagerness to listen to and learn from perspectives from the global South. I learned just as much from other members of my cohort as I did through the formal training."

Mohammed is now CEO of the Cropper Foundation, a non-profit foundation that brings together people, ideas and approaches for more environmentally sustainable and just development in the Caribbean Region, primarily in the fields of environmental resource governance and management, sustainable agricultural livelihoods and education for sustainable development.

And he has acquired the language needed to put the environmental case to the private sector back home. "I don't just want to be seen as a tree-hugging environmentalist but as someone who can engage with the corporate sector and talk in a way that they will understand. I have learned to talk their language to make the case for nature – because we need all sectors on board for a more sustainable tomorrow." ›

I don't want to be seen as a tree-hugging environmentalist but as someone who can engage with the corporate sector and talk their language

Above

Maracas Falls, Trinidad and Tobago

The beautiful Maracas Valley is under threat from slash and burn deforestation, extensive quarrying, and population influx.

Alexander Girvan / The Cropper Foundation

The Climate Group

Helen Clarkson

Philosophy, 1993-96

Trekking across the Glacier National Park in Montana was a moment of true personal insight for Helen Clarkson (Corpus 1993). “I noticed that the glaciers seemed smaller and there were fewer of them. Before that I suppose there had been a slow realisation that the climate emergency was the issue of my time. But those glaciers made me ask myself, what are you really going to do with your career? This is the most important issue facing the world. I knew I wanted to be involved in mission-driven work – and here was the mission.”

Her path had been determined some years earlier. When she graduated from Cambridge, she was too young to join Médecins sans Frontières (MSF) so she trained as an accountant. “But as soon as I reached 25, I was off. I did four years in the field in Africa with MSF, including working with the last mission in the Congo, where I ran a field hospital, and provided basic healthcare in South Sudan. I saw how environmental issues affect the economy and society. When the rains fail and the crops are poor so many suffer, particularly the women.”

After her Montana epiphany, Clarkson spent a decade working in the US with Forum for the Future, seeking to persuade organisations to include the environment in their business strategy. Four years ago, she moved back to the UK to take up her current role as CEO of The Climate Group, whose stated mission is to drive climate action, fast.

We are seeking to create major coalitions between governments and business, with campaigns like EV100, aiming at making electric transport the new normal by 2030

“We are seeking to create major coalitions between governments and business, with campaigns like EV100, aiming at making electric transport the new normal by 2030. RE100 is our global corporate renewable energy initiative, bringing together businesses committed to 100 per cent renewable electricity. Here we are pushing for action both on the supply side and among policymakers.”

Her message is that business cannot afford to wait. “The cost of not acting now is so much greater than doing nothing. It is never going to be fast enough, but right now the tailwind behind climate action has never been stronger.”

Top

Ubitricity, Twickenham

A smart cable conversion enables vehicle charging from a lamp post

David Gee / Alamy

Left

Electric Trucks, Germany

Nikola Iveco preparing to start series production of electric heavy-duty trucks

Andreas Gebert / Bloomberg / Getty

Race to Zero

Fiona Macklin

Modern Languages, 2012-16

As the Race to Zero Campaign Coordinator, Fiona Macklin (St John's 2012) and the Climate Champions' team are rallying non-governmental organisations to take rigorous and immediate action to halve global emissions by 2030 and deliver a healthier, fairer zero carbon world in time. "We are seeing an exponential growth in commitment. The campaign now comprises more than 4,470 businesses globally, 799 cities, more than 45 healthcare institutions, 730 higher educational establishments and 35 regions. Now our focus lies on translating these commitments into meaningful action."

Macklin was studying in Australia during the bushfire crisis in early 2020 when she volunteered for the Red Cross as Team Leader in the Emergency Services Department. She found herself in Mallacoota, one of the worst hit areas in the state of Victoria. "It was viscerally frightening. I had never been so directly exposed to such a climate-related disaster. It is so clear that the climate emergency cannot be seen as 'somebody else's problem'. Even in the city of Melbourne the smoke was so acrid you couldn't go outside without a mask for a week. That was when I knew I had to dedicate my career to the climate emergency."

Macklin feels privileged and empowered to be working on the climate emergency but believes that addressing the climate crisis should intrinsically be a core part of everyone's job, and influence everyone's lifestyle. "COP26 was the most pivotal COP yet. It is not too late to prevent the worst impacts from climate change, but it risks being too late very soon. We need a concerted effort from all of society to step up to the challenge and seize the opportunities in front of us. Through radical collaboration, I feel optimistic that we can put ourselves back on the right path. We just need to do so very quickly."

Macklin and four fellow rowers from the Blues boats of 2014 to 2018 are also contributing to raising awareness among alumni. "We are supporting the University in setting up a network to expand knowledge of the crisis, with concrete tools alumni can use to take action at many different levels. We need to empower each other as individuals so we can fight this together because, unlike other races, this is one we either all win or we all lose."

The smoke was so acrid you couldn't go outside without a mask for a week. It was the moment I knew I had to dedicate my career to the climate emergency

Above

Bushfires, Kununurra, WA

In 2020, Australian bushfires scorched 18.6 million hectares, the equivalent of almost 77% of the UK's total land area.

John Crux / Getty

Alumni Fiona Macklin, Melissa Wilson, Kirsten Van Fossen, Catherine Foot and Claire Lambe are working with the University to form the Cambridge Alumni Climate Network. To find out more, visit: alumni.cam.ac.uk/climatenetwork

Home

repair

Landscape regeneration is a key part of the climate change puzzle. Damage has been done, but it's not too late. Now, we need to do more than conserve – we need to restore.

WORDS **SARAH WOODWARD**
PHOTOGRAPHY **JULIAN ANDERSON**

Wicken Fen

As Britain's oldest nature reserve, a rare example of surviving undrained fenland, Wicken Fen has been the focus of ecological studies by University researchers for at least a century – from the pioneering pollen analysis and vegetation studies of Sir Harry Godwin (Clare) in the 1920s and 30s to long-running investigations of cuckoo behaviour by Professor Nick Davies (Pembroke) – as well as providing a rich training ground for generations of Cambridge students of ecology and geography. In 1999, the National Trust launched its Vision project to create a diverse landscape for wildlife and people, restoring natural processes and carefully managing water and grazing to allow the land to evolve a range of habitats for a wide variety of wildlife.

Edited by ecologist Laurie Friday (Clare 1974), Wicken Fen: The Making of a Wetland Nature Reserve *tells the story of Wicken Fen and sets the scene for the landscape restoration project.*

Previous

Boardwalk hide

Wicken Fen is home to more than 9,000 species, including hen harriers, sedge warblers and short-eared owls.

The new wind pump

Clean, calcareous water is raised from Monk's Lode, keeping the deep peat of the Sedge Fen wet.

Right

Wicken Lode

This medieval channel, created to control flooding of rich fen pasture, provides a vital freshwater habitat.

Opposite

Ranger Ajay and Koniks

Free-roaming, grazing animals, such as Konik ponies, are essential to influence developing vegetation at Wicken Fen.

Over the next 20 years, we humans are going to have to think seriously about how we can repair our home – the Earth. Restoring habitats that have been lost. Supporting and resurrecting biodiversity. Extracting less. Planting more. And the starting point for it all is landscape regeneration.

"It is painfully obvious that over decades the approach to conservation in Europe and the UK has been inadequate," says Dr David Thomas, Programme Director of the Endangered Landscapes Programme at the Cambridge Conservation Initiative (CCI). "Conservation measures have failed to slow the decline in habitat and species loss. To address the biodiversity and climate crises we now need to do more than just conserve, we need to restore."

The Endangered Landscapes Programme researches and supports large-scale projects that will restore biodiversity and ecosystem processes to landscapes across Europe. And there is no larger project – at least in the UK – than the one they are involved with in the Scottish Highlands, Cairngorms Connect. "Too many of our protected areas are fragmented – and often small. To adapt to climate change, species need to be able to move, but as habitats have become fragmented that is becoming ever more challenging. Large spaces also need less management, being more reliant on natural processes to create a variety of habitats that support species diversity."

Andrew Balmford, Professor of Conservation Science, agrees that restoration work is vital, especially in areas such as the UK. "We have lost much of what we had, our woodlands and wetlands. The UK has one of the lowest percentages of natural habitat cover anywhere in the world. But restoration work costs more and takes longer than securing what we still have. And we are still losing high-quality habitats today."

The central challenge is how to reconcile food production with the need to make space for nature. "For the past 30 years in the UK we have encouraged a 'wildlife-friendly' land-sharing approach, attempting to produce food and protect wildlife in the same place. But if we are going to meet our future food demands without relying even more on imports and hence creating greater demand in other countries, then pursuing this approach will mean we have even less space for nature reserves."

Balmford says there is another way: land-sparing. "We've found that species simply cannot cope with living alongside human extraction of resources such as food, timber and fish.

Ownership of a project has to start with the involvement of the community – restoration is a long-term commitment of land and resources and a deeply emotional process

In the second approach, some space is assigned to high-yield farming, which means other space can be left entirely to nature. It turns out that the vast majority of species prefer it that way."

Some of this work has been led by students and colleagues from Brazil and India, and the team has worked in Ghana, Kazakhstan and Mexico too, as well as closer to home. "Across Europe, people have cleared large areas of land and domesticated the ecological processes – flash floods, fires, avalanches and disturbance by large herbivores – that maintain high levels of diversity in natural habitats. Many species rely on such disturbances," says Balmford.

The Cambridge group's work suggests that in present-day European landscapes these ›

We need to go beyond thinking of restoration as just planting trees and protecting forests. Grasslands and wetlands are equally important

disturbances can be mimicked by certain traditional farming practices – a third type of land use that ensures the needs of almost all species can be met alongside food demand. "In the UK, we are already considering paying farmers to provide those things that the market doesn't provide for, such as protection against flooding and the preservation of biodiversity. But we also need to see high-yield farmers as part of the solution, because their productivity is key to making space for nature elsewhere on the landscape."

For Dr Lynn Dicks, a change in agricultural practices is key to reducing the negative impacts of that activity. Working in the Department of Zoology, Dicks leads the Agroecology Research group, where much of her research concentrates on wild pollinators. She believes that we need to recognise that wildlife is important to production. "The process of protecting wildlife within farmland need not drive destruction of natural habitats elsewhere. Some agro-ecological approaches to farming lead to lower yields per unit area, so larger areas of land may be required to produce the same amount of food. We are looking for ways to make productive farms more diverse and wildlife-friendly, without that compromise."

She and her team are involved in the 'Healthy soil, Healthy food and Healthy people' (H3) project, which for the first time has introduced experts in public health to work alongside ecologists in reshaping the UK's food system. "The farming community realises their reliance on synthetic fertiliser is not sustainable. With regenerative agriculture, they are borrowing from some of the old systems of diverse crop mixes, continuous cover and integrated livestock." Dicks also works closely with researchers in Chile and Brazil, who are leading work with commercial fruit farmers that export fresh produce to Europe. Together, they are testing methods to enhance wildlife on these farms, without compromising on yield or quality.

Working with a cluster of farmers in Cambridgeshire and the South Downs has also been an immensely positive experience for Dicks. And such local projects are the way forward, says Dr Mike Maunder, CCI Executive Director.

Above

Highland cattle

Cattle use the landscape in different ways to the Konik ponies, creating diverse and dynamic habitats.

Right

Saw Sedge

National Trust ranger John among Saw Sedge, which is cut on a four-year rotation. The resulting piles of cut vegetation create a unique habitat for many invertebrates.

"Ownership of a project has to start on the ground, with the involvement of the community – restoration is a long-term commitment of land and resources and a deeply emotional process for a community. There has been an amazing transition in scale since the 1980s when I started working in ecological restoration." Today there is a global commitment to restoring one billion hectares, with the global Bonn Challenge alone committed to restoring 350 million hectares by 2030.

CCI represents the world's largest aggregation of conservation organisations, and Maunder has seen rapid change. "Restoration has become mainstream as a response to the dual challenges of species extinction and climate change. The magnitude of loss is such that we need to urgently protect what survives and build around those wild areas extensive networks of restored landscapes."

Advances in technology have helped. Professor David Coomes, Head of the Forest Ecology and Conservation Group in the Department of Plant Sciences, says Earth-observation satellites and cloud-computing resources have revolutionised his team's efforts. "We use remote sensing technologies to track changes in forests around the world. Lidar (light detection and ranging) is proving particularly valuable as it builds 3D pictures of forest height from which carbon storage can be monitored." Using hyper-spectral imagery, he and his team can now measure the level of nutrients in the canopy and judge the success of regenerative forestry projects.

"Working out where deforestation has occurred is now routine from satellite imagery, but what has not been possible until recently is measuring the degree of carbon in the forest on a larger scale. Such measurements underpin the programme for carbon trading offset, and we are working hard to come up with solutions that bring together open-access satellite data from multiple sources."

Coomes takes heart that the services of ecosystems to humanity are starting to be recognised. "Palm oil is a valuable commodity. But carbon storage is now known to be an important aspect of the forest. If we can effectively measure its contribution to climate change mitigation, then we can make the monetary argument to protect it."

As Mike Maunder puts it, "Ecological restoration is an ambiguous term. While it is about returning the processes, abundance and diversity of nature, it is also about future-proofing society against extreme events linked to climate change, and supporting livelihoods, security and business. We are creating the conservation landscapes of the next 100 years, regenerative landscapes where both nature and society can thrive."

WHEN? NOW. HOW? LIKE THIS.

In a post-COP26 world, the opportunity to make real and lasting change has never been greater. But we all need to act, and act now.

WORDS **LUCY JOLIN** PHOTOGRAPHY **GIDEON MENDEL**

Drowning World

In this series, photographer Gideon Mendel sets out to show human lives within the context of the overwhelming climate emergency. His subjects are portrayed not as disempowered victims, but as people with agency amid the calamity.

Adlene Pierre
September 2008
Savanne Desolée
Gonaïves, Haiti

As if it weren't clear enough, 2021 has given us plenty of reasons to act. Dramatic flooding in the UK, Germany, Uganda and Bangladesh, wildfires in Greece and Australia, extreme heat in the northwest United States and Canada – the list of extreme weather events just grows and grows. We know we need to transition to a net zero world. But is it possible to make a rapid transition? Right now?

Climate scientist Dr Emily Shuckburgh is in no doubt. If we all work together – not just governments, but individuals, businesses, charities, everyone – we can make deep, meaningful change, now. "This decade – the 2020s – is the one in which we must act," she says. "The goals of the landmark Paris Agreement of 2015 are firmly in focus: emissions halved by 2030; net zero achieved by 2050; the temperature rise kept to well below 2 degrees, with an ambition to keep it below 1.5 degrees. But that's just the start. We all need to play our part in turning those ambitions into action – and do it in a just and fair way."

She should know. As Director of Cambridge Zero, Shuckburgh heads up the University's ambitious climate initiative – giving her unique insight into how Cambridge researchers, across all fields, are carefully putting in place the pieces of the zero-carbon puzzle to make rapid transition possible.

Take Professor Sir Richard Friend at the Department of Physics, who says that large-scale transition to renewable energy is now financially viable. "We know it's going to work. As recently as a decade ago, many of us were feeling quite disconsolate that we had a serious problem and no affordable solution, but now the renewable future is within our grasp. Solar costs have fallen by a factor of 10 in the last decade, and in many parts of the world, solar is now the cheapest form of electricity generation. If the right ›

investments are made, to bring both generation and storage to scale, switching to renewable-only energy generation is a fully viable option. This was not expected."

In fact, sustainable renewable energy has three pillars: industrial scale, which has brought down manufacturing costs; finance; and science and tech. "You have to look at the whole ecosystem. But the Chinese have demonstrated that prices can fall, with scale. The financial markets now understand that renewable energy investments are quite safe, and consequently pension funds rather than risk capital are going into renewables."

The current technology works and is cheap, but excitingly, still has scope for vast improvements, particularly, Friend believes, solar cells, which currently don't use two-thirds of the energy in the solar spectrum. "We need new materials, designs and strategies, and I am very confident that in 10 years we will have that extra efficiency. The markets are very good at delivering things if there is a customer.

"It's very hard to disentangle the three pillars. You can't just say 'do this' and everything else will follow. But every month spent not scaling up wind and solar is wasted, because cheap renewable energy allows solutions to many other hard-to-solve problems to become more affordable, such as aviation or manufacturing cement."

The returns are getting higher and higher because the urgency is getting greater and greater

Indeed, over in Land Economy, Professor of Climate Change Policy, Laura Diaz Anadon, is examining the role of the electricity sector in helping to decarbonise other parts of the economy. Policy focused, her group is examining how everything from R&D investments to regulation and fiscal incentives can deliver not just emission reductions but also wider social goals such as just energy transition and local economic development.

"It's not as simple as putting in subsidies or auctions for wind farms, for example. We're going to need a bold mix of policies to lock out the fossil fuel-based economy

Graham and Kieran Leith

June 2007
Toll Bar, Doncaster
South Yorkshire, UK

In order to get politicians to be brave enough to put a radical policy in place, they need to know they will not be punished later in terms of votes

and move us quickly towards a new energy system. This requires redirecting financing flows, consumer behaviour, and infrastructure investments, among other things," she says. "Context matters. How big your country is, the institutional structure, what other industries you have, and, crucially, how credible and comprehensive the policy mix is, all have an impact."

So where would she start? Perhaps surprisingly, with ensuring popular support. "Policies have to be politically viable. It is more likely that there will be more politicians willing to support strong policies, and that the effort will be sustained, if they think they will not be punished later in terms of votes," she points out.

But if that all sounds like something that government can get on with without the support of individuals, think again, says Diaz Anadon. "Government policy is an essential ingredient, but the research shows we will all need to step up. Organised movements, communities and unlikely alliances are crucial because they create action faster," she says.

"Take, for example, the environmental movements of the late 1980s and mid-1990s in Germany. They stimulated the creation of local renewable energy co-operatives and associations that helped lay the groundwork for the influential national feed-in tariffs in the early 2000s. Or, more recently, how effective fossil fuel divestment movements around the world have been at getting commitments from thousands of institutions to divest. This is having an impact in the discourse around finance."

Environmental economist Dr Matthew Agarwala, project leader of the Wealth Economy project at the Bennett Institute for Public Policy, has been examining the practical trade-offs of transition – and what the solutions might look like. "A ban on internal combustion engine sales will support a rapid ›

Anchalee Koyama
November 2011
Taweewattana District
Bangkok, Thailand

Kingsley Isiakpere and Edna Silas
November 2012
Igbogene
Bayelsa State, Nigeria

Shirley Armitage
February 2014
Moorland Village
Somerset, UK

transition in personal transport, for example, but it needs to run alongside investment in a standard charging infrastructure. Phasing out gas boilers has to be accompanied with financial mechanisms which put green alternatives within reach of everyone, not just the rich. And even with green tariffs, incentives, rebates and grants, heat pumps are still out of reach for most people."

But while we need to make short-term trade-offs, we would all benefit from a better understanding of the difference between costs and investments, he says. Climate change has costs with no benefits – lost lives and destroyed businesses. But rapid transition is about investing in action that will have huge, often incalculable, benefits. Borrowing money to invest in wind farms or decarbonise buildings with retrofitted solar panels is a cost which will benefit humanity every single year going into the future.

Indeed, those who quibble about the costs of a rapid transition don't see the benefits, Agarwala points out. "They ignore the beneficial returns – and the severe costs of what we will face if we do not make this investment. This is hamstringing action. There are some who just do not comprehend the magnitude of the downside cost of climate change. And there are some who simply do not comprehend the scale of the opportunity from a green revolution. The returns are actually getting higher and higher because the urgency is becoming greater and greater."

That urgency is felt in Cambridgeshire and Peterborough, where much farming is conducted on peatland – a significant source for greenhouse gas emissions when they are eroded, but conversely an effective way of storing carbon when they are well-managed. "The action of taking greenhouse gases out of the atmosphere will be needed as part of the net zero goal – after all that's what the net bit means to counterbalance the remaining emissions," Dr Shaun Fitzgerald, Director of Research in the Centre for Climate Repair at Cambridge, points out. "We are going to see these scale

Whether you're influencing policy, investing in renewable technology, riding your bike to work or making a difference in your workplace, you're already part of the solution to the biggest problem humanity has ever faced. And this is just the beginning

up beyond just net zero so that we can start to actually reduce greenhouse levels."

With input from Cambridge Zero, the Cambridgeshire and Peterborough Independent Commission on Climate have created recommendations for an action plan that has brought together farmers and other sectors such as business, transport and housing. Across every sector, rapid transition requires partnership, which is one of the reasons Shuckburgh says that when she is asked if there are reasons to be cheerful, "the answer is a wholehearted 'yes'. I have found a huge amount of energy and enthusiasm. Wherever I go, and whoever I talk to, there's always a real and building sense of people wanting to get involved and help."

So, whether you're influencing policies to drive forward greenhouse gas removal, investing in renewable technology, riding your bike to work or making a difference in your workplace, you're already part of the solution to the biggest problem humanity has ever faced. And this is just the beginning.

"Yes, the challenge is huge," says Shuckburgh. "But so is the opportunity to invest in green jobs, fairly distributed across the globe; to support with education, skills and training; to build a more sustainable, resilient infrastructure. We can all use the influence we have in both our personal and professional lives to spark this change. Failure is not an option. Change is possible."

×6

From 2002-2018 the total UK exports of packaging waste increased sixfold

National Audit Office, July 2018

Alaba International Market, Nigeria

Every year, thousands of tonnes of discarded TVs and other electronic waste arrive here from Western Europe, the US and China. In 2008, using a radio frequency transmitter hidden inside a TV set, Greenpeace tracked its journey from a council-run collection point in the UK to this market, arriving via Lagos Harbour in container no. 4629416.

↑ Image by Peter Essick / Cavan

In 2020, the UK exported
688,000 tonnes
of plastic packaging waste

Environment Agency National Packaging Waste Database

A fair transition

If inequality is bad for society and bad for the environment, any change to a more sustainable world has to be fair. But what does a just transition look like?

WORDS **LUCY JOLIN**

"The transition to a more sustainable world must have one core value at its heart, and that's doing no harm," says Dr Shailaja Fennell, Professor of Regional Transformation and Economic Security, at the Department of Land Economy. "Whatever interventions we make, we must ensure that people in the poorest countries and communities are not worse off than they were before."

Fennell knows that however we tackle the climate emergency, it's going to have to work for everyone. A transition that includes dumping plastics in the global South, or allowing rising energy costs to be shouldered by those least able to afford it in the UK, won't work in the long – or indeed, even the short – term.

"Inequality is bad for society and for the environment," says Dr Anna Barford, Senior Research Associate at the Cambridge Institute for Sustainability Leadership. "In an unequal society, educational attainment and trust goes down, as Richard G. Wilkinson and Kate Pickett show in *The Spirit Level: Why More Equal Societies Almost Always Do Better*. Homicide, depression and mental health problems increase.

"And you get lower levels of things like recycling. I'm not saying that recycling is the solution to everything. But it's an indicator of a society where that sense of doing something for the greater good is more prevalent. We need that sense of collective responsibility to tackle the challenges of climate change." ›

Countries in the global North effectively have a debt to the countries of the global South because of their historical emissions

Professor Bhaskar Vira
Professor of Political Economy
Department of Geography

← *Image by Lydia Goldblatt*

How can this 'just transition' be achieved? Transparency will be key – particularly around finance. Professor Mizan Khan, of the International Centre for Climate Change and Development (ICCCAD), is Bangladesh's lead negotiator on climate finance for the United Nations Framework Convention on Climate Change (UNFCCC) process. He points out that many low- and middle-income countries are already overburdened with massive bilateral and multilateral debts, where interest payments outstrip those of the principal. Yet the global North not only refuses to pay the true price of its polluting – it makes more money from it in the form of loans to tackle it.

"In the past decade, developed countries pledged $100bn by 2020 to developing countries to tackle climate change," points out Khan, who sits on the external advisory board of the Cambridge Global Challenges Strategic Research Initiative. "But the latest figures from the OECD show the figure of $78.9bn delivered in 2018. But Oxfam's Climate Shadow Finance Report 2020 brings the actual amount down to just $19-22bn as net climate finance. Moreover, the overwhelming share of climate finance is delivered as loans, not grants. This is tragic."

400 billion

tonnes of CO_2 have been emitted by the U.S. since 1751, more than any other single country, making up 25% of global emissions

↑ *Image by incamerastock / Alamy*

In the space of a few months, he points out, the G20 was able to mobilise $11trn as a support package for addressing Covid-19. "But for the past decade, we could not even mobilise $100bn for climate change. Even in 2020, when we were suffering from Covid and the climate crisis, defence expenditure has gone up. And this is largely for perceived threats – not real threats, such as climate change. Threats that policymakers create in their minds. This is where the injustice lies."

It is also, as ever, a question of history. "Countries in the global North effectively have a debt to the countries of the global South because of their historical emissions," says Bhaskar Vira, Professor of Political Economy at the Department of Geography. "Some countries have over-consumed historically. They have effectively occupied the space in the atmosphere that might rightly have belonged to other countries." The United States, for example, has emitted more CO_2 than any other single country: its 400 billion tonnes since 1751 make up 25 per cent of global cumulative emissions. Yet it is the global South which suffers disproportionally from its effects.

The small island developing states (SIDS), including Fiji, the Bahamas and the Maldives, together account for less than one per cent of greenhouse gas emissions. But rising sea levels threaten their very existence. Climate reparations, says Vira, could play a key part in a fairer future. "This would mean debt cancellation by way of compensation for the climate debt that the global North owes the global South. The South could then use this money to support their own transition towards net zero."

A just transition must also be inclusive: everyone's voices must be heard. "Even in rich countries, the proportion of household income that goes towards personal mobility, transport and energy is higher for the poorest households compared to the richest households," says Vira. "Transition policies that focus on replacing household boilers or cars will therefore hit the poor disproportionally. We must ensure that the voices of those who feel threatened are heard. We need to include the voices of those who will be the most impacted by climate change, including those in the UK."

The IPPR's report, *Fairness and Opportunity: A People-Powered Plan for the Green Transition*, highlights areas of the UK that are likely to suffer the most in the energy transition: 10 per cent of total employment in Aberdeen City and Aberdeenshire is currently in the oil and gas industry (more than 24,000 jobs in total). The Tees Valley and County Durham is home to 60 per cent of the UK's energy-intensive industry and generates carbon emissions three times higher than the UK average. Areas such as these must benefit from transition opportunities: subsidies, for example, that allow them to move towards producing green energy. ›

<$100bn

mobilised by the G20 for climate change in the past decade

↑ *Image by Kathryn Hansen / NASA*

Sea ice melt ponds in Alaska, 2011

Crew from the U.S. Coast Guard retrieve a canister during mission ICESCAPE, a NASA study looking at the chemistry and ecosystems of the Arctic ocean.

$11trn

mobilised by the G20 for Covid-19 in just a few months

↑ *Image by Leon Neal / Getty*

Covid-19 testing in Bedford, 2021

A woman processes a swab test at the Faraday Community Centre, an asymptomatic Covid-19 test centre.

↑ *Image by Simone Tramonte*

Krafla power station, Iceland

Emissions from this geothermal power station are reinjected back into the geothermal wells, where they react with basaltic subsurface rocks to form stable minerals for safe, long-term storage.

50,000 tonnes

of CO_2 were locked away in the geothermal reservoir at Krafla power station in 2020

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Mr & Mrs Bailey-Webb, Warsash

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"Governments have a role to play to cushion the impact on the most vulnerable groups, even within the UK," says Vira. "As the UK transitions to net zero, we have to ensure that that doesn't impact the poorest and the most vulnerable groups. Market forces won't be enough. It will need government intervention – and that resonates with the government's agenda around levelling up."

Because the politics of it all will matter. Any government intervention will need to be locally focused and designed in partnership with those who will be affected. "If people are not on board, it will not be either sustainable or long-lasting," says Dr Cristina Peñasco, Lecturer in Public Policy at the Department of Politics and International Studies (POLIS). "If these actions are not well designed, all these ideas of building back better and levelling up will not happen – and we can't afford that any more."

For example, the circular economy model offers vast benefits in terms of less pollution, less exploitation of natural resources and better use of materials, says Anna Barford. "It's about being more careful and caring about the things that we use, so that we can extend their lifespans and move away from this disposable society. But you must do that with an eye on what is happening in society – to jobs and to access to things as service models change. There has to be provision to ensure that the things people need stay within their means."

The vast amount of knowledge around nature-based solutions, resulting from the lived experience of indigenous populations in local communities, must be acknowledged and used, says Dr Sara Serradas O'Holleran, Research Strategy Manager at Cambridge Global Challenges.

"These populations own and very sustainably manage more than a quarter of the global land area, but their traditional and local knowledge – climate-smart practices on crop production, water collection and use, and managing sustainable agroforestry systems, for example – is on the verge of extinction.

"There is some progress on this: in 2019, the Intergovernmental Panel on Climate Change (IPCC) recognised that indigenous peoples in local communities can play a fundamental role in addressing climate change. Not including the global South means missing out on key knowledge for a successful transition. Both Cambridge Global Challenges and ICCCAD are acting on this problem by looking to combine Indigenous Peoples and Local Communities (IPLC) knowledge and scientific knowledge for adaptation to climate change in the most vulnerable countries."

> **"Indigenous peoples and local communities can play a fundamental role in addressing climate change. Not including the global South is missing out on key knowledge for a successful transition"**
>
> **Dr Sara Serradas O'Holleran**
> *Research Strategy Manager*
> *Cambridge Global Challenges*

200,000

tonnes of carbon could be saved in 2022 by the implementation of the Plastic Packaging Tax in the UK, and the use of recycled plastic in packaging could increase by up to 40%

↑ Image by Eddy Galeotti / Alamy

Along with this local knowledge, research – about what works and what doesn't – needs to be readily available to all. Peñasco's team recently released an online policy evaluation tool as part of the Innovation Pathways for a Low-carbon Transition (INNOPATHS) project co-ordinated by Professor Paul Ekins at UCL. It is co-directed at Cambridge by Professor Laura Diaz Anadon and Professor Elena Verdolini and funded in the EC's Horizon 2020 framework. It allows policymakers around the world to see the real-world positive and negative effects of policies such as a carbon tax. "And that enables us to learn from past mistakes, reverse those negatives and transform them into positives," says Peñasco.

Fennell is leading the team that has delivered a survey of the latest research to the first ASEAN Development Outlook (which focuses on ensuring inclusion and sustainability in South-East Asia), that was launched at the end of August 2021. She has been working in close collaboration with researchers across this vast and diverse region to investigate four themes: identity and culture; disaster management and climate change; the changing world of work and health; and human security. The team used Foresight, a set of thinking tools, that allowed them to take a particular problem and look at the impact. "For example, the use of plastics: what should be the solution? Should it be taxed? Would better education be more effective? What are the risks and the returns? We are becoming more knowledgeable and therefore our own capacity to solve these collective action problems is increasing."

Making a just transition will not be easy. But it remains the right – and most practical – way forward, politically, socially and for the climate. "There is a very strong moral case to address poverty, and just imagine what the people who are currently living in poverty could contribute to society if we did that," says Barford. "Imagine the innovation and ingenuity that we could all benefit from if they had had a different set of opportunities."

Urban revolution

Want to go green? Move to the city. There are lots of great reasons why urbanites have a lower carbon footprint, and Cambridge is behind many of them.

WORDS **PETER TAYLOR WHIFFEN**

The Intergovernmental Panel on Climate Change has declared Code Red for humanity. Human inhabitants of the Earth are right to fervently hope we reach net zero very soon. But what then? We can't go back. Urban life is better for the environment – city dwellers use fewer resources overall. But building carbon-neutral cities will require immense change, and demands that we draw on the latest cutting-edge research.

× Timber

Wood has been used as a construction material since humans began building – but a new engineered wood could enable us to create safe, solid, timber skyscrapers, says Professor Michael Ramage, who leads the University's Centre for Natural Material Innovation. "Cross laminated timber (CLT) is the first significant construction material since reinforced concrete over a century ago. Past growth of cities has not been sympathetic to the environment – but future growth can be."

CLT consists of planks of sawn, glued and layered wood, with each layer at right angles to the previous one. "It's like an enormous sheet of plywood," says Ramage, "but the way it is constructed makes it structurally rigid and able to be used on a huge scale. It's bigger and stronger than a tree."

Rotterdam

The Lodge, a proposal for a 125m-high riverside mixed-use timber tower in Rotterdam.

PLP / Architecture, Centre for Natural Material Innovation, Smith and Wallwork Engineers

The Centre's research projects include an experimental 300m timber skyscraper in the middle of London's Barbican – dwarfing the world's current tallest wooden building, standing at 85m in Bergen, Norway. "The first steel-framed skyscraper, the Home Insurance Building in Chicago, was built in 1885 and was also 85ft," says Ramage. "Within 50 years we had the 381m Empire State Building. Using timber, and today's chemistry, biochemistry, physics and mathematics, we can do that again.

"Sustainable trees are designed for trees to be planted as crops, to be cut down like wheat or hay – and for every one we cut, we plant more than two in its place," says Ramage. "Sustainable forests in Europe have expanded by more than 10 per cent in the past 20 years. And every tonne of wood holds 1.8 tonnes of carbon dioxide – it's a naturally excellent material for carbon sequestration. By any measure it's better to build from timber rather than concrete or steel, in almost any circumstance. We can move to a place where the materials we use to construct our buildings are grown, not mined." ›

We can move to a place where the materials we use to construct our buildings are grown, not mined

Living buildings

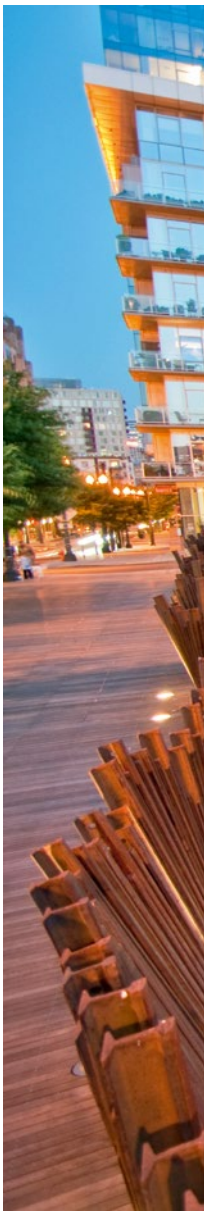
The construction, heating, maintenance, and demolition of buildings make the greatest contribution to a city's carbon footprint. But the science is already here to negate that environmental impact. "Geothermal energy is a fantastic green way to heat buildings," says Abir Al-Tabbaa, Professor of Geotechnical Engineering. "People are aware of heat pumps, but if you're going to pile into the soil anyway to build, why not include this heat extraction from the ground into your foundations? A few pipes and steel reinforcement and it's there."

Doing this for individual buildings would be like having your own personal turbine on your roof, she says. Research is still ongoing into the effects of temperature changes on the foundations ("we obviously don't want it to compromise the short-term or long-term integrity of the building") but the science has huge potential for heating entire cities in the future. "There is the potential utopia of new cities being heated from one geothermal bore hole hundreds of metres into the earth."

It's not just the heating of the buildings that can be greener. Al-Tabbaa's team is developing green cement for concrete and other applications that can not only repair itself but also clean the air around it, and even sequestrate carbon (using carbon sorbents within the concrete). "Concrete buildings have a traditionally huge carbon footprint over their lifetime," she says. "The problem is, the people who build them are not usually the same people who maintain them, so they don't care about their carbon footprint years down the line. So, if you develop and use materials that can monitor their own health and repair themselves, and also tell the maintenance team which assets in the city are a priority, you won't need to replace them. Eighty per cent of the infrastructure we will have in 2050 we already have now, so this isn't so much about new buildings, it's about looking after what we have in a low carbon and sustainable way."

If you have materials that can monitor their own health and repair themselves, then you won't need to replace them

The James Dyson Building, Cambridge
A large number of innovative, self-healing and low-carbon concrete blocks were used in the construction of the James Dyson Building.
Photography: Alan Williams



Data

"Infrastructure isn't a series of individual projects," says Dr Jennifer Schooling, Director of the Cambridge Centre for Smart Infrastructure and Construction (CSIC). "It's a vital system of systems, the veins and bones of our places. Gathering, using and properly applying data cohesively can help our understanding of that infrastructure, leading to better design, construction and management practices."

Schooling says it's about tying the data together to reduce the carbon output across every aspect of the urban space. "Data helps us contextualise things. Vehicles are transitioning from diesel to electric but that doesn't mean they're carbon neutral – they need to be made in a green way, so we need to ask if we can exist as we are, with everyone having their own car. You can talk about

Tanner Springs Park, Portland

Formerly an area of rail yards and industry, Tanner Springs is fed by stormwater and now forms a refuge for wildlife in the heart of the city.

Photography: Ramboll Studio Dreiseitl

Water management

"Urban water planning has traditionally involved controlling rainfall where it falls," says Professor Richard Fenner, "collecting it in ever bigger pipes and moving it away. But where is away? It still has to go somewhere, which then causes problems to a community further downstream. It's more sensible to deal with it at source."

The best way to do that, say Fenner and his colleagues at the Centre for Sustainable Development, is to infiltrate that water back into the ground through innovative sustainable drainage systems. "It's about recreating pre-development hydrology – using vegetated surfaces, turning things back to how the area would have responded before we built anything there."

The water is infiltrated in natural surface depressions such as ponds and wetlands, which doesn't just manage flood resilience naturally, it brings numerous other benefits. "You're improving habitat and adding diversity. Vegetation can sequester carbon, mitigate and attenuate noise from, say, roads, provide amenity and recreation opportunity along green corridors which can improve health, and broad leaf plants can trap air pollutants and clean up the air."

But what about urban areas where water might not naturally infiltrate the ground? "People tend to treat urban and rural drainage separately but we need to join the dots," says Fenner. "It's not necessarily about infiltrating the water in the city but managing the amount of water that gets there."

Now, says Fenner, it's about getting across the positive message of the benefits. "People think these systems are strange and new and we don't understand them and they might not work. But not only do they work – and not only is it the 'right' thing to do – but all these enormous wide-ranging benefits improve our livability, our health and our quality of life. Why wouldn't we embrace them?" ›

water systems going net zero, but it takes a lot of electricity to purify it. And we need to manage the construction of roads, railways, energy and water systems better, so we can understand how we can use fewer resources, what condition these systems are in, what maintenance they need – and how we can do this in a low-carbon way."

And data is everywhere. "From satellite data and sensors to mobile phone and even social media data (to help understand how the infrastructure is used), there is so much available." And the CSIC extols the idea of designers using a 'digital twin', a digital version of a physical infrastructure or built environment that uses data from the physical structure to model future scenarios and solutions.

"Efficiency is about reducing uncertainty," says Schooling. "It's also about being able to optimise

Efficiency is optimising a whole system, even if that means making one thing less efficient to enable other things to have a greater overall positive impact

a whole system, even if that means making one thing less efficient to enable other things to have a greater overall positive impact. If you work only in a particular bubble you can't do that. But proper, data crossover and collaboration can help us do this."

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Dr Pearson, Kinross

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The Entopia Building, Cambridge

This 1930s telephone exchange will be a world-first for a retrofitted sustainable office building, and is projected to result in an 80 per cent saving in whole life carbon emissions (more than 10,000kg CO_2e/m^2) compared to a standard office refurbishment.

Artists Impression: Architype

Retrofitting

Research by Dr Ruchi Choudhary, leader of the multi-disciplinary Energy Efficient Cities Initiative, has helped create tools that simulate multi-period energy retrofits and promote spatial energy optimisation.

"We all share resources in a city, from services, to mobility, to static infrastructure," says Choudhary, a reader in Architectural Engineering. "They are energy intense, but more efficient per capita. However, the problem with European cities in particular is their ageing. What do we do? Demolition is not efficient or desirable for many reasons, so the challenge is how we upgrade, how we refit.

"Ten years ago, we picked the low-hanging fruit, initiatives such as LED lighting that would pay for themselves in their own lifetime. But the bigger issues are those that don't pay for themselves in their lifetime. A decade ago, we'd be recommending condensing boilers as good enough, now it's about fuel switching, which is much more costly but needs to be done now."

In many city buildings it's unclear who is responsible for retrofitting, she says. "You might have offices, residential flats and retail operations all in the same building – one shell with multiple different interests," says Choudhary. "Government needs to resolve this. In the short term it's about not wasting energy, but in the longer term we need to leverage our growing renewables, but you need proper policies and incentives to make fuel switching economically feasible."

Demolition is not efficient or desirable for many reasons, so the challenge is how we upgrade, how we refit

And you may also need local, tailor-made policies. This, says Choudhary, is where research benefits the change. "Every area is different, whether it's spatially or the typology of houses," she says. "They won't all benefit equally at the same time, so we need to push for more research – and more acceptance of the research. We need to take the longer-term approach to research that extends far beyond our lifetime, and have the resources to do it."

The Dasgupta Review is clear: to remain useful, the tools of economics must be reshaped with the natural world at their heart

WORDS **VICTORIA JAMES**

The warning was stark: "We have collectively failed to engage with nature sustainably, to the extent that our demands far exceed nature's capacity to supply us with the goods and services we all rely on. We would require 1.6 Earths to maintain the world's current living standards."

This was the headline finding of *The Economics of Biodiversity*, Professor Sir Partha Dasgupta's review of the economics of biodiversity decline. And, as the UK prepared to host November's COP26 UN Climate Change Conference in Glasgow, it prompted Prime Minister Boris Johnson to note that economic prosperity and environmental protection are two sides of the same coin, as he pledged to ensure "the protection of nature is rooted in our policy, economic and financial decision-making in the UK and around the world".

Dasgupta, the Frank Ramsey Professor Emeritus of Economics, declared his overarching aim to be "the reconstruction of economics to include nature as an ingredient". The resulting report, commissioned by HM Treasury in 2019 and some 610 pages long, is unprecedented in its approach and scope.

At its heart lies the concept of 'impact inequality' – the imbalance between humanity's demand and nature's supply. One side of that equation is determined by the extent and nature of individual demands, the size of the human population and "the efficiency with which we convert nature's services to meet our demands and return our waste back into nature". On the other side is nature's stock of natural assets and its ability to regenerate them. Currently, the equation is not in balance – and that imbalance is growing steadily worse.

Key to the report is the concept of 'impact inequality' – the imbalance between humanity's demand and nature's supply. The equation is not in balance – and growing steadily worse

The review notes how biodiversity is declining faster than at any time in human history, with extinctions running at between 100 and 1,000 times the baseline rate. This is already devastating, with some ecosystems at (or beyond) a tipping point that could have catastrophic consequences for human economies and wellbeing. Reversing those trends, Dasgupta argues, "would be significantly less costly than delay, and would help us achieve wider societal goals", not only addressing climate change, but also helping alleviate poverty.

A central challenge is the invisibility of nature in the way global economic systems assign value. Consequently, nature's worth – "the true value of the various goods and

Orkney Islands

The Orkney Islands are situated at the meeting point of the Atlantic ocean and the North Sea and are exposed to heavy winds and exceptionally strong currents. This test site for tidal energy was the first tidal turbine to deliver electricity to the UK's national grid in 2006.

services it provides" – is not reflected in market prices.

More than that, this invisibility means that humanity's impacts on nature "are hard to trace and go unaccounted for". The report assigns culpability not only to this market failure, but to broader institutional failure, such as the fact that "governments almost everywhere pay people more to exploit nature than to protect it".

Three key recommendations are made by Dasgupta and his wide-ranging advisory panel, which included: former Barclays Chair Sir Ian Cheshire (Christ's 1977); Professor Cosmas Ochieng (Clare 2000), previously a Director at the African Development Bank; Dame Fiona Reynolds, Master of Emmanuel College and formerly Director-General of the National Trust; and Lord Stern (Nicholas Stern) (Peterhouse 1964), author of the monumental 2006 Stern Review which broke new ground in its in-depth examination of the economics of climate change.

When we measure wealth properly, taking nature into account, we will be better custodians of the planet. It is high time we build and measure growth differently

The first recommendation is to ensure our demands do not exceed nature's supply, and to increase that supply by such means as decarbonising our energy systems and adopting sustainable food production. This cannot be achieved solely through technological innovation – "damaging forms of consumption" must be broken, for example by enforcing standards for re-use, recycling and sharing.

The second recommendation counsels that existing economic measures of success, such as GDP, must be fundamentally rethought. It argues that a new concept of "inclusive wealth should incorporate natural capital into national accounting systems".

The third recommendation demands that we urgently transform our institutions and systems, in particular our finance and education systems, to enable these changes and to sustain them for future generations.

The Dasgupta Review is a monumental piece of work, provoking much debate at this autumn's COP26. Hailing it a "landmark contribution to our understanding of the relationship between nature and our economy", Governor of the Bank of England Andrew Bailey says that central banks are engaging on these issues. And Dr Akinwumi Adesina, President of the African Development Bank Group, notes: "When we measure wealth properly, taking nature into account, we will be better custodians of the planet... It is high time we build and measure growth differently."

PHOTOGRAPHY: MATJAZ KRIVIC / CLIMATE VISUALS COUNTDOWN

This idea must die: ‘Sustainability is too expensive and requires too many tough sacrifices’

Clare Shine, Director and CEO of the Cambridge Institute for Sustainability Leadership, says we all have a part to play in an exciting future that’s being reimagined around us.

WORDS **VICTORIA JAMES** ILLUSTRATION **GEORGE WYLESOL**

Sustainability is, for many people, a remote word that covers everything and nothing. We’re told we must travel less, that we can’t buy the cars or eat the food we want, that we’ll need to replace our boilers. Such messaging can make us feel we lack agency – it may be scary or counterproductive. Yet the vast majority of us want to support a just transition to a future that works for people, nature and climate.

So, I want to challenge the idea that the ‘S’ word is all about sacrifice. Yes, change is urgently needed and yes, we need to rewire the economy and leadership – but there’s too much focus on doom and gloom. We need fresh language and fresh messaging around what should be exciting and inspiring progress. The stories we tell about how we achieve sustainability really matter.

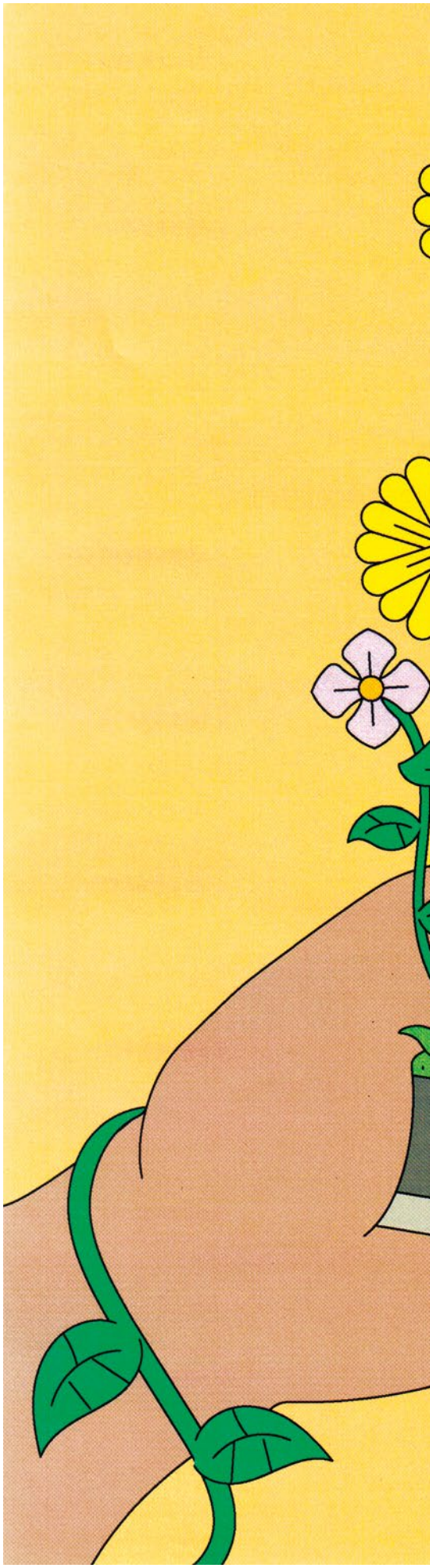
Think about how we can improve wellbeing, for example. Most health services are reactive and costly systems for when things go wrong. There’s remarkably little prevention woven through the system, even though we know that pays dividends for society and the economy. So, let’s use our imagination: What could a health-generating city or school or company look like? How could it incorporate brilliant design into people’s daily lives? How might this inspire innovation, technology and policy?

The Covid pandemic has already been a remarkable catalyst for reimagination and reinvention. It showed up the negative aspects of our lives, such as long commutes and long working hours, and it reminded us of the benefits – both psychological and physical – of nature, play and community.

Let’s take that learning and look forward. Trillions of dollars are being spent around the world right now on new cities and urban infrastructure. By 2060, three quarters of the world are predicted to live in urban settings. We can make decisions now that will put accessible green space – and blue space – as a first principle; decisions that work with and through nature to create living and livable cities that generate wellbeing rather than stress. I truly hope tomorrow’s historians will see Covid as one of the prompts for a new compact between humanity and nature.

It’s fantastic that awareness is spreading, but I worry that we conceive this too narrowly. For example, there’s a risk that the response to the climate emergency is being formulated too technocratically – that we’re being conditioned to think of the emergency as only about carbon and action on climate change. But planetary health is bigger than a carbon target – the lives and livelihoods of people around the world depend on a flourishing environment and ecology. We need to talk not just of a climate emergency, but of a *nature*-climate emergency.

I’m excited by the creative ways we can expand this conversation. Look at how artists and cultural innovators are linking social and environmental themes around the world, surfacing new voices and bolder debate. And look at the way vocabulary



I hope tomorrow's historians will see Covid as one prompt for a new compact between humanity and nature

can shift the mindset of conversations. The advance of LGBTQ+ equality was helped by adopting language that brought down barriers and universalised discourse around love, family and children. We can do the same to humanise sustainability.

Innovation for public good is breathtaking: in India, rural health workers now use solar-powered backpacks for rapid testing and referral of women with difficult pregnancies; in Kenya, mPesa's mobile money transfers enabled previously unbanked people to save and transact; an artist in the Netherlands created an energy-neutral cycle path that lights up at night to guide you safely home; and in Ghana, the mPedigree app helps even the poorest customers check the authenticity of medicines. Design and technology can help us achieve a sustainable future, meeting the fundamental needs and wants of societies across the world.

Yes, there is a nature-climate emergency. But we can do so much as individuals and communities, using our collective voice and harnessing creativity, intelligence and innovation. The future is being reimagined all around us – and that's definitely not a cause for doom and gloom.

The University of Cambridge Institute for Sustainability Leadership (CISL) works with business, government and finance to build the capacity of leaders to meet the needs of society and to address critical global challenges. Through education, leadership groups and partnerships with those who make or influence decisions, CISL aims to transform public and private sector policies and practices.

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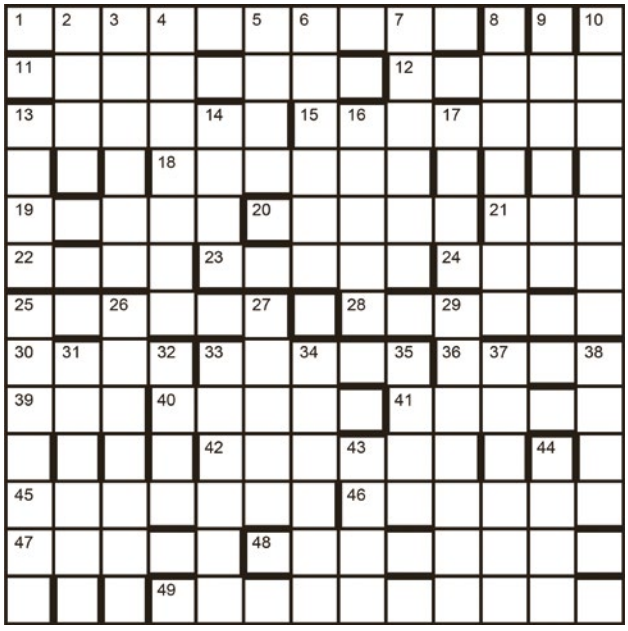
If you happen to have a print of the class photograph of the Part II Physics undergraduates scheduled to graduate in June 1994, please contact

Tadao Nakai at
kyoto777fun@gmail.com

Another Brick in the Wall by Nimrod

In an Only Connect Wall, 16 arbitrarily arranged words, phrases or names must be sorted into four groups of four, each group with a different thematic link. In this puzzle, such a wall is formed using answers to the 16 clues that appear neither at their correct numbers nor with their correct letter-counts. Wordplay for each such clue ignores one answer letter; in printed order, these letters spell an instruction solvers must carry out in the final grid. "Wall" answers are symmetrically disposed in the grid. All other clues and entries are normal. The shortened form at 12 is in *Collins*, *SOED* and *ODE*; its regular form is in *Chambers*. 27 is in *SOED*.



Across

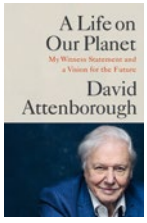
1 Crossing that more than one breeze would facilitate (10)
11 Top hat choice! (8)
12 Egotist's favourite subjects covered by medic's printed document (5)
13 Souped up imitation (6)
15 Fee-paying fans leaving on vacation fortunately staying near the ground (7)
18 Ring compiler's mobile pouched by girlfriend (6)
19 Treatment accepted by guru (5)
20 Aged sufferer accommodated by homes and elsewhere (5)
21 New Year treats put out at intervals (3)
22 Spy unit of some substance (4)
23 To pick up repaired ring I'm forsaking new marriage licence (5)
24 Staying united, red bats last out of the ark (4)
25 Superior object of devotion (6)
28 Literary hand behind several murders resident in South Devon (6)
30 Lovers of old signs of affection (4)
33 N Yorkshire community's hearts captured by scintillating Nimrod! (5)
36 Life at home only partly cushy for Ed (4)
39 Old stick who followed Trygve around? (3)
40 Wind from South America? Somewhere else, clearly! (5)
41 Uncommonly sticky military types in gym working out (5)
42 Indo-European forged ID card (6)
45 Scoring zero repeatedly, to win it so unlikely for us? (7)
46 Being blue-eyed boy with multinational Number One may add to this (6)
47 Four players not getting question about tropical fish (5)
48 One fleeing northbound covers disturbance on screen (8)
49 Body mass accumulates, unhappily, when digesting stewed meat (10)

Down

2 Honeyeaters cycling round Hebridean islands (4)
3 Brilliant bathroom powder obliterating cloudy liquid (6)
4 Brutal practices one's uniquely embraced in Yorkshire? (7)
5 Evidently wiped clean memory space (4)
6 Horsemen mounting up comprising units for Remembrance (6)
7 Circus employee an icon of peace and happiness! (6)
8 Zip Corporation workforce is stitching fold (7)
9 Giant landmark of York one's overlooked (6)
10 Outbacker's near, keeping quiet! (7)
13 Curious I'm thinking about complaint (4)
14 Something chancer throws on black jackal (4)
16 Johnson has confused lining and underfur (5)
17 They're trusted to rule on clan of ancient Rome (4)
25 Missionary Francis so named by state (7)
26 Sentry keeping an eye out regretted ever ascending keeps (7)
27 Scots assail the state of France (5, 2 words)
29 Unhappily, uncorrected slips tend – sadly – to happen again (7)
31 Eccentric marquess harbours a space scientist (6)
32 Show the first female nude in The Sun (4)
33 About twelve, looking up? (6)
34 Lie about bear pouches (6)
35 Local opposed to Plymouth, say? (4)
37 Botched role in Carmen, perhaps, or The Ring? (6)
38 Bottom, perhaps, one brandishes (4)
43 Plant sap identified in the Bush? (4)
44 Mix of pleasure and pain as expressed in Latin obscenities (4)

All entries to be received by 11 February 2022. Send your entry:

- **by post to:** CAM 94 Prize Crossword, University of Cambridge, 1 Quayside, Bridge Street, Cambridge CB5 8AB
- **online at:** magazine.alumni.cam.ac.uk/crossword
- **by email to:** cameditor@alumni.cam.ac.uk



The first correct entry drawn will receive a £75 CUP book token and a copy of *A Life on Our Planet, My Witness Statement and a Vision for the Future* by David Attenborough (Ebury).

Two runners-up will receive a £50 CUP book token. Solutions and winners will be published in CAM 95 and online on 25 February 2022 at: **magazine.alumni.cam.ac.uk/crossword**

Solution to CAM 93 Crossword Eating Out by Nimrod

The full quote, from NEIL GAIMAN (silver cells) is – extra letters in capitals – 'GENRE FICTION is a stew. You take stuff out of the pot, you put stuff back. The stew BUBBLES ON'; its originator Terry PRATCHETT. Normal clues gave COWHERD, NIRVANA, RISHI, LICHI, SOVIETS, CHARIOT, ESCAROLES, SHAH, OSCULATES and CLAW, rearranged to give stews (red cells). The central answer TAGINE, also a stew, is given cryptically by the puzzle's title. The direction WEST is STEW "in a stew".

Winner: Matthew Brockwell (Downing 2013)
Runners-up: Frances Williams (Newnham 1970)
Joanna Choules (Fitzwilliam 2013)

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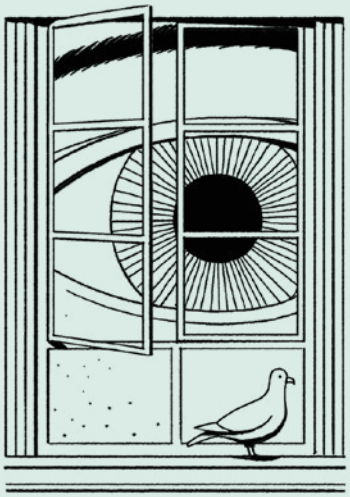


Alumni Festival 2021

Eighty sessions, five days and hundreds of voices: this year's Alumni Festival addressed all the big questions. Find out more and view recorded sessions at cam.ac.uk/2021-alumni-festival

Digital resources

Explore a wealth of online resources from Cambridge's Colleges, departments, museums and more. From virtual tours to online exhibitions and interesting webinars covering a wide variety of topics, there's something for everyone. alumni.cam.ac.uk/digital

Alumni groups

You're eligible to join more than 400 volunteer-led alumni groups around the world. Most are geographic, while some special-interest groups bring together alumni in the same sector or who have a shared interest. Visit alumni.cam.ac.uk/groups to find your nearest group.

Cambridge Advance Online

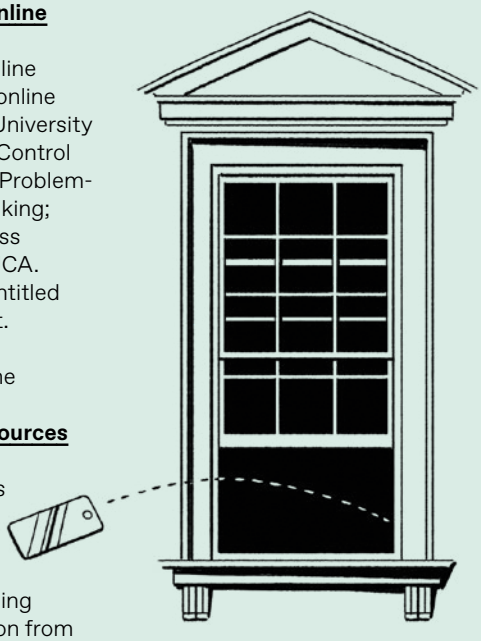
Cambridge Advance Online is a new programme of online short courses from the University of Cambridge, such as: Control Engineering; Creativity, Problem-Solving and Design Thinking; and Intercultural Business Communication and VUCA. CAMCard holders are entitled to a 15 per cent discount. alumni.cam.ac.uk/cambridgeadvanceonline

Journals and online resources

Explore your free access to a number of online academic resources wherever you live around the world, including the new Higher Education from Cambridge University Press, which offers the highest quality content to support successful teaching and learning journeys in today's rapidly changing educational environment. alumni.cam.ac.uk/journals

Alumni Careers Connect

The University Careers Service has launched a new online platform – Alumni Careers Connect. The network for students, researchers and alumni is inviting our global community to connect – and share advice and insights – by becoming a mentor. To find out more, visit careers.cam.ac.uk/exploring-your-options/alumni-careers-connect



University podcasts

Looking for your fix of top-name commentary and the very latest thinking? Delve into the world of the University's alumni podcast series, featuring topics from across the worlds of academia, government, civil society, politics and business, as well as philosophical and scientific musings. alumni.cam.ac.uk/podcasts

Boat Race 2022

Save the date: the Boat Race returns to the Thames next year on Sunday 3 April.

Alumni bookshelf

Read recently published titles from the Cambridge community. alumni.cam.ac.uk/benefits/book-shelf.

Heffers subscription
Give the gift of a Heffers subscription – offering a new book each month for up to a year. Visit alumni.cam.ac.uk/hefferssubscription

Alumni Book Club
Join the debate at the bi-monthly virtual Alumni Book Club, now with dedicated Colleges forums. Find out more at alumni.cam.ac.uk/benefits/alumni-book-club

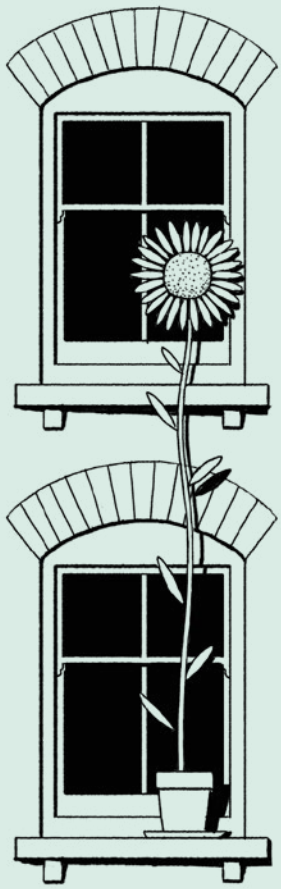
Cambridge Conversations

Listen, connect and engage with current Cambridge thinking in this popular webinar series. For details and a selection of recent recordings, visit alumni.cam.ac.uk/2021camconversation

Covid-19 latest

Latest Covid-19 research and analysis
Keep up to date with the latest Cambridge research and analysis on the global pandemic at cam.ac.uk/coronavirus

Stay Safe Cambridge Uni
The University and Colleges have established a clear set of measures, tested and refined in consultation with more than 300 students and staff, designed to keep our community as safe as possible. To find out more about the Stay Safe Cambridge Uni campaign, visit cam.ac.uk/staysafecambridgeuni



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Welcome to The Genius Square!

The aim of each of the 62,208 possible puzzles is to complete the square using the nine coloured shapes, once the seven 'blockers' have been positioned. There may be times when it seems impossible, but there will ALWAYS be at least one solution…and that's why it's called The Genius Square!

Good Toy Guide Recommended

"Outstanding. Nobody in the family can put it down. We are actually getting a second set - it's that good! Best game any of us has ever played!" ★★★★★
Debra Sobel, London

Each player receives a Genius Square grid (two are included) and a set of the nine coloured shapes, plus seven 'blocker' pieces. Roll all seven of the dice together and place a 'blocker' piece into the squares matching the seven co-ordinates that appear on the dice. Now race your opponent to fill every other space on the grid using the nine shapes.

There are 62,208 possible combinations in which the dice can fall. Using a specially devised computer programme, we have confirmed that all of them have at least one possible solution. Some combinations will be easy to solve, some much harder. It's all in the luck of the roll of the dice.

As soon as somebody finishes first, roll the dice and play again! An example of how to play is shown above. You can also play alone and challenge yourself against the clock!

Ages 6 to adult. For 1 or 2 players. Box size approx. 19cm x 19cm.

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