

Arms conversion for a low carbon economy



David Webb argues that a major industrial shift away from military technology should be a key component in building the low carbon economy.

In a speech to a 'Low Carbon Economy Summit' in London in June 2008, Gordon Brown stated that "By 2050 the overall added value of the low carbon energy sector could be as high as \$3 trillion per year worldwide and it could employ more than 25 million people. So my goal is simple: I want Britain to achieve a disproportionately large share of these new global jobs".¹ The government has since put together a series of initiatives – including a Low Carbon Transition Plan (see p.8) – but given the scale of action needed there are strong arguments for the government to go much further. One course of action that has received little attention among policy-makers is the prospect of a major shift in skills and resources away from military industry.

Low carbon industry versus military industry?

The UK's record on expanding renewable energy has not been good. The latest figures show that, in relative terms, the country was third from bottom in the EU with only 2.1% of primary energy being generated from renewable sources.² Yet, the UK has abundant resources available to be tapped. For example, offshore wind farms will be critical in meeting the greenhouse gas targets for 2020, and wave power

will need to be developed on a commercial scale to meet the 2050 targets. The UK especially benefits from having high power wave fronts that are situated relatively close to population areas.

The UK could be investing serious finance into innovation in the renewable field. Yet, according to data from the International Energy Agency, the government only spent £66m on R&D for renewable energy in 2008 – significantly less than the US, Japan or Germany.³ It is particularly interesting to compare this limited investment with spending on military R&D. Government statistics⁴ reveal that this totalled £2,598m in 2007/08 – about 40 times that for renewable energy. The UK also has the fourth largest military budget in the world,⁵ and its current and planned procurement includes a replacement for its Trident nuclear weapons system, over 200 Eurofighters, two new aircraft 'super-carriers', new submarines, new battleships and other equipment totalling tens of billions of pounds in the coming years. A strong case can be made for switching at least some of this huge budget to speed up the expansion of renewable energy and energy efficiency, especially given the security threat posed by climate change.

The jobs argument

One reason often given for maintaining military/defence expenditure is the employment dependent upon it. However, government figures reveal that the low carbon environmental goods and

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Join SGR - as a Member or an Associate

SGR is an independent UK-based membership organisation promoting ethical science, design and technology. Our work involves research, education, lobbying and providing a support network for ethically-concerned professionals in these areas.

You can join SGR as a member if you are or have been a science/design/technology professional in the broad meaning of the words: our members come from many disciplines including natural sciences, social sciences, engineering, computing, architecture and design, and interdisciplinary areas. They work in research and development, manufacturing, teaching, science writing, or are students or retired. Members are invited to contribute their expertise to help make SGR even more effective.

If you are not a science/design/technology professional, but want to support our work, you can help us by becoming an associate.

Please consider joining by standing order as this will save us time and money, and help us to campaign more effectively.

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Information provided on this form will only be used to administer your membership. SGR does not pass on or sell information about our members to any third parties.

Editorial Issues

The editorial team for this issue of the SGR Newsletter was:

- Stuart Parkinson
- Vanessa Spedding
- Kate Maloney

The opinions expressed within, including any advertisements or inserts, do not necessarily represent the views of SGR.

Please send articles, reviews and letters for the newsletter to newsletter@sgr.org.uk or the SGR postal address (above).

Copy deadline for next issue: 1 June 2010

Join the SGR Forum e-mail list!

SGR Forum is our internal e-mail list. It is used mainly for news and announcements (of SGR and other events). Forum members also engage in the occasional brief discussion via this channel, for example when a member requests information, advice or help. All SGR members who have internet access are encouraged to join.

To join visit <http://mailman-new.greennet.org.uk/cgi-bin/mailman/listinfo/sgrforum> and following the (very straightforward!) instructions from there.



A few words from the Director

Public-interest science is under a great deal of pressure at the moment – with potentially serious consequences for society and the environment.

In the summer, the UK government decided to give responsibility for policy on business, science and universities to a single Ministry – the newly created Department for Business, Innovation and Skills – the first time control of these three distinct areas has been under one roof. Then, in December, the government announced that funding for universities over the next three years was to be cut by over £900 million¹ – urging them to seek more funding from business. The government's aim is clear – to push for even closer links between commerce and academia – but the risk is that the independence and reliability of research and higher education is compromised. This has been highlighted by the latest in-depth report from SGR – *Science and the corporate agenda* (see p.5), which documents extensive evidence from the last 20 years of the detrimental effects that can and do arise when the commercialisation agenda becomes too powerful within science.

But the area of public-interest science that has come under the most fervent attack over the past couple of months has been climate science. Emails 'obtained' from the University of East Anglia's Climate Research Unit (CRU) and released by climate sceptics on the eve of the Copenhagen negotiations caused a furore. Commentators – many with a clearly free-market ideology – seized on these as a 'smoking gun' that evidence was being falsified. Then came unusually cold winter weather, followed by the revelation of an

erroneous figure for glacier melt in the Himalayas in the last major report of the Intergovernmental Panel on Climate Change (IPCC). In the UK, journalists from some sections of the press have been particularly quick to use these news stories to question whether global warming is even a problem. Sadly, many other people are now also starting to have doubts. Worse, these journalists are trying to discredit a range of senior climate scientists – such as the heads of the IPCC and the Met Office – and pour scorn on their organisations.

But these accusations are hardly a firm basis on which to dismiss decades of peer-reviewed climate research, publicly funded across the world through research councils and science foundations. Although a handful of the CRU emails were distasteful – and are under official investigation – others have been taken completely out of context, and together they hardly provide the evidence of conspiracy that the sceptics claim. (In contrast, the revelations of SGR's new report are much more damning.) As for the cold weather – any environmental science student could point out that climate change is about determining trends across the globe over decades, and cannot be dismissed due to one cold winter. And the Himalayan glacier error? It's certainly embarrassing for the IPCC, but in the context of the 3,000-page report, it's laughable to suggest that this negates the fundamental messages. It's worth remembering that, when the IPCC report was first published – back in early 2007 – there was some controversy over the figures for projected sea-level rise up to 2100. The IPCC had specifically opted to present conservative figures, not including the full contribution from global

ice-sheet melt, because of the uncertainties. In the years since the report came out, several academic papers have been published concluding that the contribution from ice-sheet melt is likely to *double* the IPCC estimates for total sea-level rise.² Sadly, the climate sceptics ignore such things. But given the very disappointing outcome of the Copenhagen climate negotiations (see p7), this media frenzy could become a real threat to timely action to tackle climate change.

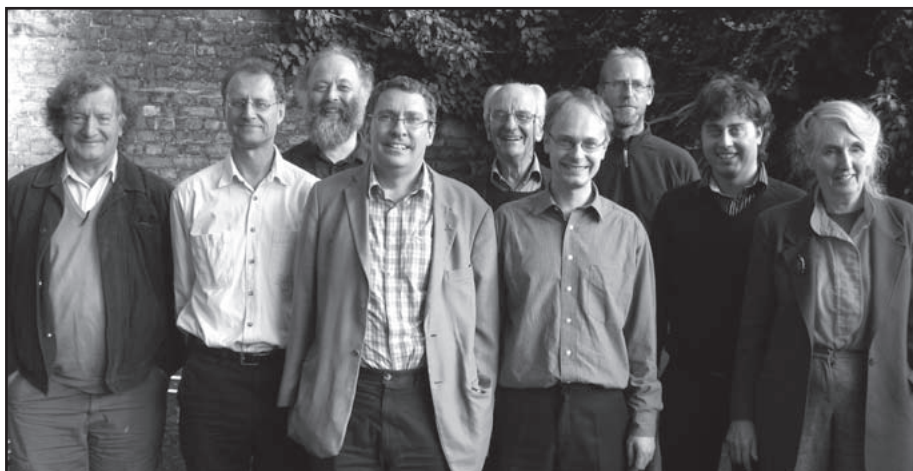
However, one thing that this furore has highlighted is the importance of openness. For example, the University of East Anglia's failure to respond adequately to Freedom of Information (Fol) requests helped fuel the initial media stories. SGR's 2008 report – *Behind Closed Doors* – had previously warned universities that they needed to markedly improve how they deal with Fol requests. Another example is the fact that peer-reviewed papers on climate science are normally only available on subscription-only websites, and data-sets are not always public. In contrast, climate sceptic material is freely available across the web. This can lead to a very distorted view of the evidence within wider society. Reforms are urgently needed if trust is to be restored.

Stuart Parkinson

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1. BBC news online (2010). 'Bleak future' for universities. 12 January. <http://news.bbc.co.uk/1/hi/education/8454545.stm>
2. See, for example: Rahmstorf S (2007). A semi-empirical approach to projecting future sea-level rise. *Science*, vol. 315, p368-3-70.

The new National Co-ordinating Committee



Caption: Some of the new NCC and staff (from left to right): David Hookes, Philip Webber, Alasdair Beal, Tim Foxon, Roy Butterfield, Stuart Parkinson, Patrick Nicholson, Harry Tsoumpas, Kate Macintosh

The election for SGR's National Co-ordinating Committee (NCC) for this year was held during the Annual General Meeting on 24 October (see report on p.32). The new NCC is as follows:

Chair:	Philip Webber
Vice-chair:	Kate Macintosh
Treasurer:	Patrick Nicholson
Secretary:	Harry Tsoumpas

Committee members:

Martin Bassant, Alasdair Beal, Roy Butterfield, Tim Foxon, David Hookes, Patricia Hughes, Rachel Marshall

Climate and energy activities

Climate and energy issues have been in the public eye a great deal in recent months, with the Copenhagen climate negotiations, the launch of new UK strategies on the low carbon economy, and heightened media coverage of climate sceptic activities. SGR has continued to be very active in these and related areas.

Our main activity in this area in the last few months was our annual conference in October, this year entitled *Building a low carbon economy*. A report on the conference, attended by 70 people, can be found

on p.30, with articles based on the keynote presentations on p.1, p.8 and p.9.

Other activities to promote the transition to a low carbon economy included signing several joint letters with other campaign groups to Ministers, MPs and the media on greater support for the expansion of renewable energy, including a more generous tariff system for small-scale technologies. We also wrote in support of striking workers at the Vestas wind turbine factory in the Isle of Wight. Stuart Parkinson gave a presentation on arms conversion for a low carbon

negotiations. To coincide with one of the preparatory meetings in September, *The Independent* ran a double-page article featuring leading climate campaigners and scientists – including SGR Director, Stuart Parkinson – calling for urgent action. SGR also wrote to the Prime Minister and signed related petitions and statements. On the first day of the Copenhagen conference, Stuart took part in a one-hour live discussion on the issues on local radio. SGR members also took part 'The Wave' climate demonstrations in London and Glasgow (see photo).

economy at a climate campaigners' conference in November. Kate Macintosh ran an SGR stall at another conference on the low carbon economy in Winchester. Media coverage of these activities included SGR being quoted in the magazine, *Professional Engineering*.

Obviously, we were also active in support of a strong agreement from the Copenhagen climate

The furore about the University of East Anglia emails in advance of the Copenhagen negotiations – promoted by climate sceptics as evidence that the humans are not the main cause of climate change – led to a huge increase in downloads from the SGR website of material relevant to this debate, including information about common climate myths. Stuart wrote a blog entry on science section of *The Times* website that pointed out the influence of fossil fuel industry and its associates in distorting the scientific evidence.

SGR has also continued to highlight the links between climate change and conflict – including a presentation at a public meeting in Kingston – and the weapons proliferation risks of an expansion of nuclear power – including taking part in a live radio debate on the BBC World Service.



SGR members take part in the 'Wave' climate march in Glasgow in December

A big "thank you"

... to all those who responded so generously to SGR's November 2009 appeal. We are pleased to announce that by the end of January the amount raised had reached nearly £5,000, although we still have a way to go to reach our target of £8,000.

But it's not too late to make a donation! This can be done using the gift aid form sent out with the appeal letter.

Thank you also to all those who make one-off or regular donations throughout the year. Not only do your donations help SGR's work directly; they also demonstrate to other potential funders the high level of commitment of our members. Your support is vital in keeping the organisation going.

THANK YOU once again!

Promoting ethical careers

SGR continued to promote ethical careers in science, design and technology, through stalls at careers fairs and a dedicated section of the SGR website.

During 2009, we had a presence at eight careers events. This included stalls at careers fairs at the universities of Birmingham, Cambridge, Cardiff, Oxford, Leeds and Strathclyde (Glasgow), as well as running workshops at Nottingham and Sheffield universities. In addition, SGR's ethical careers material was available at Freshers' fairs at Bristol and Cardiff universities.

Thanks to all the volunteers who helped at these events: Barbara Barrett, Martin Bassant, Alan Cottey, Tim Foxon, Ed King, Aart and Wiebina Heesterman, Rachel Marshall, Max Wallis, David Webb, and Tony White. If you would be interested in helping with SGR stalls at future events, please contact Kate Maloney at the SGR office on <info@sgr.org.uk>.

Despite not publishing any new briefings during the year, demand for SGR's material remained very high. About 3,000 copies of our ten existing ethical careers publications were either downloaded or picked up at careers events during the year.

In addition, Stuart Parkinson was interviewed for careers articles in *Science* magazine and the *Ethical Careers* website.

Security and disarmament activities

SGR's activities to challenge militarism in science and technology and support disarmament work more generally have continued apace.

Five presentations on military influence on science have been given since the last Newsletter, three by Chris Langley and two by Stuart Parkinson. The most notable was a keynote lecture at the annual conference of the German Institute of Physics. Other presentations were given to student groups at the universities of Cambridge, Sheffield and Strathclyde (Glasgow), as well as an academic paper presented at a conference at Manchester Metropolitan University. This paper was later published as a chapter in the book, *Power in the academy*. A further

article by Chris Langley was published in a staff newsletter at the Open University.

We have also continued to support campaigns against nuclear weapons. The 'Rethink Trident' coalition – of which SGR is a supporter – was re-launched in December with press coverage in *The Independent* and the *Daily Mail*. More than a dozen of SGR's senior members signed the pre-launch campaign statement. Many SGR members also signed up in support of the new campaign – 'Scientists for a nuclear weapons-free world' – organised by our international partners, INES (see p.10). Finally, we were especially pleased to learn that a feature article from a recent SGR newsletter, highlighting the threat from high-alert nuclear

weapons, was quoted in a speech by the Chilean Ambassador to the UN General Assembly last May.

SGR has also been assisting the Campaign Against Arms Trade. We provided some information for their latest briefing on jobs and the arms trade, while SGR members have also taken part in their demonstrations against the DSEi arms fair and BAE Systems.

Other activities have included an SGR stall at the annual conference of the Conflict Research Society, and continued activities highlighting the links between climate change and conflict, and the potential of arms conversion for help the transition to a low carbon economy. For more info on these, see p.4.

In brief

- In the summer, a team from Kirklees Council – headed by SGR Chair, Philip Webber – received a prestigious Ashden Award in the field of sustainable energy. The project involved providing free insulation to over 40,000 homes in the local area.
- Also during the summer, SGR provided information and advice to a member who was conscientiously objecting to working on military projects as part of their job. After some negotiation, the employer in question agreed that this would be allowed.
- In November, Stuart Parkinson gave a lecture on ethical science and technology to 150 sixth-form students in Bath.
- Over the last few months, SGR has responded to numerous requests for information from journalists (including from *Channel 4 News* and *The Guardian*), and campaign groups (including the Campaign Against Climate Change and New Economics Foundation).
- An SGR-authored article on corporate science was published in the *California Journal of Science Education*.
- SGR signed a joint campaign statement opposing genetically modified terminator seeds.
- In the summer, Kate Maloney and Rachel Marshall ran an SGR stall at a large environmental exhibition in Kent.
- SGR signed a joint letter organised by the Institute of Science in Society to Australian officials protesting about actions that could threaten academic freedom.

Corporate science report launched

SGR's latest report, *Science and the corporate agenda: the detrimental effects of commercial influence on science and technology*, was launched on 12 October. Authored by Chris Langley and Stuart Parkinson, this 80-page report outlines the growing evidence that the science commercialisation agenda brings with it a wide range of detrimental effects. The report takes an in-depth look at the problems across five sectors – pharmaceuticals; tobacco; military/defence; oil and gas; and biotechnology – and suggests ways in which these could be tackled.

Media coverage of the report has been extensive, with articles in *The Guardian*, *The Independent*, *The Times* (website only), *New Statesman*, *Times Higher Education*, and numerous science publications and

websites, both in the UK and internationally. It was particularly gratifying to have an SGR-authored comment article in *New Scientist*. This appeared in Issue No. 2733 and is reproduced in full on p.16.

Over 700 copies of the full report were downloaded in the two months following launch, together with a similar number of executive summaries. Printed copies are being mailed to key policy-makers and opinion-formers.

The report can be downloaded from <http://www.sgr.org.uk/SciencePolicy/CorporateInfluence.html>

Printed copies can be ordered from the SGR office – contact details on p.2.

Network for Peace Annual General Meeting **POLLING DAY PLUS ONE - WHERE NEXT FOR THE PEACE MOVEMENT?**

Saturday 27 February 2010; 1.30pm
Friends Meeting House, Huddersfield, HD1 4TR

Speakers:

Professor Dave Webb, Vice-chair, Campaign for Nuclear Disarmament
Lindis Percy, Campaign for the Accountability of American Bases

Admission free, donations welcome!

For more information:

Web: <http://www.networkforpeace.org.uk>

Email: mail@networkforpeace.org.uk

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Goodbye Chris and Jane!

Over the last few months SGR has reluctantly had to say goodbye to its principal researcher, Chris Langley, and membership development officer, Jane Wilson. Chris has taken early retirement (and moved to Norway!), while Jane has stepped down due to ill-health.

Chris joined SGR in 2003 and has been author/ lead author of five reports, including the acclaimed *Soldiers in the laboratory* and our latest in-depth report, *Science and the corporate agenda* (see p.5). He has been critical in SGR's challenge to the large-scale influence of military and corporate interests in science and technology.

Jane joined SGR in 2006 and has led our efforts to expand our membership, which passed 1000 in early 2009. She has also provided important administrative help over this period.

We are sad to see them go, and wish them well!

Robert Meadows 1916-2009

Robert Meadows ARIBA MRTPI died on 28 August 2009 at the age of 93. Robert was a founding member and treasurer of Architects for Peace* from its inception in 1981, and for its first several years.

He was one of the initiators of the postgraduate diploma in urban design at the Polytechnic of Central London (later the University of Westminster). He was deeply aware, living in Notting Hill, of the multicultural, religious and social differences inherent in an urban society. These elements were reflected in the first courses of the diploma in which he was so influential.

I first met Robert when I studied architecture at what was then the Regent Street Polytechnic. He was a forbearing and wise teacher. Later, when I joined the teaching staff and I got to know him better, I became aware of his steadfastness and integrity.

He was serious about matters, but his occasional high-pitched laugh revealed his mischievous sense of humour – undiminished when he returned to teaching after a serious brain tumour operation. He and his wife Joyce, who survives him, ran a most hospitable household, including the accommodation of Architects for Peace committee meetings when other premises were unavailable. He was generous with help to all those with whom he came into contact. This dedicated peace-loving man will be greatly missed.

Jill Jones, with a contribution from Arnold Linden

Ann MacEwen 1918-2008

Ann MacEwen, who has died aged 90, was a distinguished town planner, notable for challenging the dominance of cars in the urban environment. She will also be remembered as a guru of Britain's national parks. She was a sponsor of Architects and Engineers for Social Responsibility.*

Ann's early career included working on the redevelopment of the slums and bomb sites in east London after World War II. As her career developed, she became a leading advocate against unrestrained road-building and the prioritisation of cars. She contributed to an influential report in 1963 for the Ministry of Transport, entitled *Traffic in Towns*. Later, she authored a number of important studies for historic towns and cities. In Edinburgh, she had a notable run-in with the city engineer who was infuriated by her opposition to his cherished motorway-sized bridge over the valley separating the old and new towns. She won the argument – to the city's lasting benefit.

In 1968, she and her husband moved to a house in Exmoor national park. Their experiences led to the writing – during the 1980s – of two seminal books on planning in the countryside, which gave the national parks movement a powerful intellectual basis.

Stuart Parkinson

*Architects for Peace later became part of Architects and Engineers for Social Responsibility which, in 2005, merged with Scientists for Global Responsibility.

SGR sponsors

SGR was pleased to welcome two new sponsors in September, **Prof Keith Barnham** – whose expertise is in solar technologies – and **Prof John Whitelegg** – whose expertise is in sustainable transport. We are very grateful to them for agreeing to take on this role. SGR now has more than 20 sponsors from the senior ranks of science, design and technology. A full list is given on our letterhead and website.

Meanwhile, long-time sponsor, **Prof Stephen Hawking** received yet another prestigious award, this time the Presidential Medal of Freedom, the highest civilian award in the US. In September, Stephen stepped down as Lucasian Professor at the University of Cambridge, a post which he had held since 1979. He continues at the university as Director of Research for the Department of Applied Mathematics and Theoretical Physics.

Last summer, the first commercially available houses in the UK to be certified as meeting the top level (six) of the Code for Sustainable Homes were completed. These were designed by leading eco-architect and SGR sponsor, **Bill Dunster**. The government intends that all new homes will meet code six from 2016, so these houses are a very important milestone on the road to meeting that commitment.

Apologies...

...that it's been a long while since the last SGR newsletter. It's been a very busy time (see pp.4-5) especially with the recent staff departures (see above).

From Copenhagen to where?

Stuart Parkinson assesses the outcome of the Copenhagen climate negotiations, and asks whether meaningful global action will follow.

Even despite the low expectations, the outcome of the Copenhagen climate negotiations in December was extremely weak. Commentators and politicians used a range of colourful language to criticise it, from 'Brokenhagen' to 'a suicide pact' (the latter being a comment from the Sudanese delegation).

The event's final output – the three-page Copenhagen Accord¹ – was hammered out at the eleventh hour by the USA, China and a handful of other countries, after negotiations on a much more detailed text broke down. The full conference of nearly 200 countries then only agreed to 'note' the text, rather than 'accept' it, as is the standard practice.

What the Accord said

The key aspects of the Accord are:

- To "reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius", with industrialised countries to submit voluntary targets, and developing countries to submit lists of voluntary "actions";
- Independent scrutiny of emissions accounts and emissions reduction actions;
- Industrialised countries to provide new funding for measures in developing countries to curb emissions and adapt to impacts. \$30 billion is to be provided for the period 2010-2012, with a goal of "mobilising" \$100 billion a year by 2020;
- The setting up of funds and mechanisms to ensure that this new finance supports action including reducing deforestation, transferring cleaner technologies, and adapting to climate change.

The flaws in the agreement are stark. National emissions targets are voluntary rather than legally binding, with no overarching limit, either globally or for industrialised countries. While the commitment to keep below a 2°C temperature rise is very important, without a timetable of when global greenhouse gas emissions are to peak, it is a very limited pledge.

Further serious problems can be identified in the commitments over funding for developing countries. \$10 billion a year for 2010 to 2012 is argued by many to be inadequate, while the sources of the proposed \$100 billion a year funding by 2020 are left unspecified.

There is also a lack of a clear process or timetable specified for solving any of these problems, let alone

dealing with the myriad complex issues – such as curbing deforestation or regulating carbon trading – that only received brief mentions in the Accord.

What went wrong?

Recriminations swiftly followed the conclusion of the conference, with the USA and China bearing the brunt of the criticism. Looking beyond the rhetoric it is possible to highlight several key factors:

- China's massive coal reserves and newly acquired economic strength made it more resistant to explicit curbs on emissions. According to an observer at the final round of negotiations², China insisted that emissions targets, both globally and for industrialised countries, be removed from the final agreement. India, it seems, also supported this.
- The USA's high consumption culture and powerful fossil fuel lobby continue to make it difficult for its government to commit to major cuts. The proposed US emissions target amounted to only a 4% cut from 1990 levels by 2020.³ This was considerably less than, for example, the 20-30% proposed by the European Union and 25% by Japan. Even this proposed cut is under threat due to lobbying efforts being pursued within the US Congress.
- Over 100 countries – including most African nations and the members of the Alliance of Small Island States – argued that the maximum target for global temperature rise should only be 1.5°C, as they are vulnerable to major impacts even at this level. However, it was estimated that the combined effect of targets proposed by countries at the conference would only constrain the global temperature to no less than 3.5°C.⁴
- Proposals on funding fell far short of the demands of many developing countries.
- The conference procedures required that any proposal put to the meeting could only be accepted by consensus.

Can a solid deal be salvaged?

World leaders tried to put on a brave face at the end of the talks, but the considerable weaknesses of the agreement were hard to hide. Nevertheless, it is important to bear in mind a number of positive aspects that can be built upon in the coming weeks and months.

Firstly, there *was* a deal. Many forces – including oil-rich nations, some industrial lobbies and climate deniers – sought to scupper any agreement. They failed. Secondly, the deal included a commitment to keep global temperature change below 2°C, which is

the first time this has been officially recognised in UN climate negotiations.

A further positive sign was that the conference attracted over 100 heads of state, including those of the world's most powerful nations. It is hard to point to any previous conference – on *any* issue – that has attracted such high-level involvement, which demonstrates an important level of commitment for dealing with the problem.

A fourth reason is that, in January, nearly 40 industrialised nations, including the 27 countries of the EU, the USA, Japan, Russia and Australia, signed up for voluntary targets (similar to the proposals made at Copenhagen).⁵ Furthermore, for the first time, many developing countries signed up for action to curb their growth in emissions, including China, India, Brazil and South Africa.⁶

A final promising sign is that the renewable energy and other low carbon industries are growing in influence, and – because they offer such good employment prospects compared with many other industries – they represent an important constituency that can combine economic, social and environmental goals.

These foundations must be built upon. The most worrying thing in terms of the formal negotiation process is the current lack of a clear timetable, against a rapidly closing window of opportunity for keeping below the 2°C threshold. Hence, we must keep the pressure up on policy-makers to deliver a much more comprehensive deal in the months ahead.

Dr Stuart Parkinson is Executive Director of Scientists for Global Responsibility, and co-author of the book, *Flexibility in climate policy*.

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The UK Low Carbon Transition Plan: does it go far enough?

Tim Foxon argues that, although the government's latest plans for a low carbon economy are an important step forward, they are hampered by an ideological belief in market solutions.

In the months running up to the Copenhagen climate negotiations, the UK government outlined a series of measures – notably the UK Low Carbon Transition Plan – to provide a framework for the reduction in the country's greenhouse gas (GHG) emissions. However, there remains a large gap between national efforts and the activities needed for the UK to deliver its fair share in bringing about the reductions required to avoid 'dangerous' climate change.

The framework for international action is set by the UN Framework Convention on Climate Change¹ (UNFCCC), which was agreed by 154 countries at the Rio Earth Summit in 1992. This committed nations to "stabilise atmospheric concentrations of greenhouse gases (GHGs) at a level that avoids dangerous anthropogenic interference in the climate system" and set the scene for richer, industrialised countries to act first.

Under the Kyoto Protocol to the Convention, established in 1997, industrialised countries agreed to an average 5% reduction in GHG emissions relative to 1990 by 2008-12. However with only a broad agreement – the Copenhagen Accord – reached in December 2009, a detailed international framework for action after 2012 has yet to be determined.

Based on the scientific consensus, the world's governments generally accept that action should be taken to prevent a rise in global temperature of more than 2°C above pre-industrial levels to avoid the most serious impacts of climate change. However, this target is extremely ambitious. For even a 50% chance of remaining close to a 2°C rise by 2100, global emissions need to peak by 2016 and then reduce by 3-4% every year from then.²

This implies that by 2050 global emissions must halve and the UK must cut its emissions by 80% (the UK's legally-binding target as set in the 2008 Climate Change Act). While the UK is on track to achieve its Kyoto target, this is largely thanks to the switch from coal- to gas-fired electricity generation in the 1990s; the target for 2050 is far more challenging.

As its first step, the government has established the interim target of a 34% reduction by 2020, the less ambitious target recommended by the Committee on Climate Change. In July 2009 it published the UK Low Carbon Transition Plan³ for meeting this target.

The plan commits the UK to generating 40% of its electricity from low carbon sources by 2020. The routes include finding 30% from renewables, funding up to four demonstration plants for carbon capture and storage and facilitating the building of new nuclear power stations, as well as improving the energy efficiency of existing households and businesses and bringing in zero-carbon regulations for new homes.

The plan also outlines ambitions to make the UK a centre of green industry, promising £120 million investment in offshore wind and £60 million in marine energy, though many have argued that this needs to be orders of magnitude higher.

To achieve the 30% renewable electricity target, the Renewables Obligation for large-scale generation is being extended and new 'feed-in tariffs' for small-scale electricity generation (which SGR helped to lobby for) are to be introduced. The Renewable Energy Strategy also has targets for 12% renewable heat generation and 10% of transport energy from renewables.

Whilst most of these measures are laudable, the government remains hampered by an ideological belief in market solutions. These often have unintended consequences and can be manipulated by powerful market actors. One such solution is the European Emissions Trading Scheme, a cap-and-trade scheme covering around 40% of European emissions. Because the caps for the first trading period were set too high, allowances were largely given away for free, leading to a collapse in permit prices in early 2007 and windfall profits for electricity generators.⁴ The 2009 recession caused another a reduction in permit prices. Similarly, the UK Renewables Obligation has provided little support for early-stage and small-scale renewables. Uncertainties remain about whether the new feed-in tariffs will provide sufficient incentives.

In its latest report, the Climate Change Committee argues that efforts in recent years have not been sufficient for the UK to achieve the annual reductions needed (1.7-2.6%) to meet its interim targets by

2020.⁵ In particular, the committee argues for a step-change, focussing on changes in electricity market rules to encourage investment in low-carbon generation; more support for energy efficiency improvements on a 'whole house' and 'street-by-street' basis; and support for the roll-out of 1.7 million electric cars and plug-in hybrids by 2020.

The scale of the challenge demands something like the 'Green New Deal',⁶ proposed by a group of UK economists and environmental experts to address the linked financial, energy and climate crunches. This proposes a £50 billion programme of investment in energy efficiency and local renewable electricity generation; training a 'carbon army' of workers; establishing an 'oil legacy fund' paid for by windfall taxes on oil and gas company profits; and re-regulating the domestic financial system so that money is created at low interest rates and lending is more tightly controlled. Greater support for renewables and associated infrastructure development could be provided as part of the financial programme.

Continued pressure from green groups and civil society actors is needed to ensure that all sectors of the economy, including domestic consumers, contribute to the change in attitudes and actions needed to achieve the required emissions cuts.

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This article is based on a presentation given at the SGR conference 2009.

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A charter for one million new climate jobs

Gareth Dale outlines proposals for a major increase in employment in the UK climate sector.

There is a discrepancy between the urgent imperative of mitigating climate change and the stumbling efforts of political leaders. Already, it appears that even the dramatic predictions of the 2007 report of the Intergovernmental Panel on Climate Change were overly cautious. For example, the Met Office has warned of a possible 7°C warming by the end of the century if emissions follow a business-as-usual trajectory.¹ The danger is that long before this point – in fact, beyond about 2°C – thresholds may be reached after which positive feedback mechanisms accelerate warming beyond human control. Sadly, this prospect did not seem overly to trouble the diplomats and politicians as they hammered out the very weak agreement at Copenhagen.

More broadly, the policy regime on emissions reduction, as it has emerged over recent years in the EU and elsewhere, is inadequate. It centres on the creation of markets in carbon emissions, the idea being that this ‘carbon trading’ is the most economically efficient mechanism for achieving the necessary reductions. In reality, the record of carbon trading has been abject. In the EU, lax targets have led to corporations failing to make significant reductions. Even the reductions that are claimed are in doubt because of difficulties in externally verifying the corporations’ emissions data.

In short, the current market-centred policy regime is counterproductive. What is needed is concerted state intervention focused upon investment in public works and cleaner, more efficient energy. Not only would this be much more effective, but it would also demonstrate that mitigating climate change goes hand in hand with social justice and improvements in living conditions.

‘National Climate Service’

In Britain, the Campaign Against Climate Change, backed by several national trade unions, has published a report sketching out how one million ‘climate jobs’ can be created.² It outlines a programme for building a green-energy economy, for renovating and insulating our homes and buildings, and for providing comprehensive public transport. A million new climate jobs in the UK will not solve all the current economic problems, but it will take a million people off the dole and put them to work saving the future.

How can such an ambitious programme be put into effect? Our proposal is for something similar to the way in which the government used to run the National Health Service. In effect, the government sets up a National Climate Service, and the new NCS hires staff to do the work that needs to be done. We are aware that this may not be politically possible, and part of the work will probably be done by contractors. But we want the government to control the project, so that it makes sure it happens, rather than placing faith in ‘market forces’.

Where will the jobs be created? Some of the key sectors and occupations are:

- Manufacturing and running buses and trains, and constructing new rail lines.
- Insulating buildings and installing solar heating.
- Constructing, transporting, assembling and maintaining offshore wind and marine turbines, and solar photo-voltaic cells.
- Manufacturing and erecting long-distance cables and pylons.
- Training and education in the necessary skills for all the above jobs.

And how could it be paid for? In some ways, the model for what we want to do is what happened in World War II. Then the great powers of the world took control of their economies and directed industry to make as many weapons as possible, as fast as possible. The rearmament boom did not bankrupt the governments. Instead, it created jobs and lifted the world out of the Great Depression.

We need to do the same thing now, but the focus would be on *saving* lives. Our estimates suggest that we can employ a million workers for ten years for less than the government gave the banks in one year. This is because a million climate jobs will not really cost the government all that much. The net figure would be in the order of £20 billion per year. There are several ways the government can find this sort of money. If the richest 1% each paid just 5% more income tax, that would raise £5 billion per year. The government could also borrow money or create it through ‘quantitative easing.’ It is sometimes argued that printing money produces hyperinflation. In the last year the Bank of England spent around £175 billion on ‘quantitative easing’ without creating significant problems. The figures we are proposing are much smaller.

Campaigning for change

How to proceed? The government will not easily be won to this programme. But if we mobilise a national

campaign, then it can be won. The precedent in this country was when the unions founded the Labour Party, and used it to fight for a health service and a welfare state. But trade unionists and environmentalists cannot win this campaign alone; they will have to enlist support from a wide range of organisations, from faith groups to parent teacher associations to local councillors.

Action can be of many kinds. One example is to instate union environmental representatives in all workplaces. While they are generally not yet recognised by management, we can push for this and then, through them, persuade employers to spend more money on climate activities.

The most important kind of action, though, will be to defend jobs at workplaces threatened with mass redundancies or closure. The recent campaign against the closure of the Vestas wind turbine blade factory on the Isle of Wight is one example. But we also need to challenge closures in other sectors, and to call for the conversion to more eco-friendly jobs. For example in the automotive industry, we can push for retooling to build electric buses or cars.

This means we can campaign for a million new climate jobs both from the top down – through changes to government policy – and from the bottom up – from workplace to workplace. Together, we can protect both jobs and the environment.

Dr Gareth Dale is a senior lecturer in politics and international relations at Brunel University, and an activist in the Campaign Against Climate Change.

This article is based on a presentation given at the 2009 SGR conference.

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Nuclear disarmament slowly gathers pace

Stuart Parkinson critically examines progress on global nuclear disarmament over the past year.

President Obama's speech¹ in Prague last April raised hopes of new momentum on the issue of global nuclear disarmament. He gave a commitment to "seek the peace and security of a world without nuclear weapons". Since then, there have been positive developments including proposals for a new US-Russia disarmament treaty and cancellation of some proposed US Missile Defence installations. However, it is early days and many questions remain about the appetite for nuclear disarmament within the US and other nuclear powers.

Prague's promise

Obama's speech made a range of important commitments, including:

- Reduction of the role of nuclear weapons in US national security strategy, while urging other nuclear powers to do the same;
- Reduction of nuclear warheads and stockpiles, mainly through the negotiation of a new Strategic Arms Reduction Treaty with the Russians;
- US ratification of the Comprehensive Test Ban Treaty and pursuit of a new treaty that ends the production of fissile materials intended for use in state nuclear weapons;
- Pursuit of a strengthened Nuclear Non-Proliferation Treaty (NPT); and
- A new international effort to secure all vulnerable nuclear material around the world within four years.

However, these positive promises were tempered by commitments that raise many concerns, including maintaining a strong nuclear 'deterrent' until global nuclear disarmament has been achieved, retaining a Missile Defence system to deal with Iran, and continuing the push for new nuclear power, despite worries over its contribution to nuclear weapons proliferation.

Progress in the US and Russia

A key plank of Obama's agenda is a new treaty with Russia to succeed the START and Moscow treaties. Negotiations between the two governments have led to a proposal for the US and Russia each to reduce their number of strategic warheads to a maximum of 1,675 by 2016.² Limits are also proposed for delivery vehicles. However, the limit on warheads is only 525 below the maximum allowed by the Moscow treaty – which is not very ambitious compared with previous efforts. For example, in the seven year period from 2001, the US took 3,800 warheads off active deployment and

Russia also removed large numbers.^{3,4} A further problem is that, while the numbers of warheads on active deployment have been markedly reduced, the totals in the US and Russian stockpiles are still huge – so redeployment of these remains a risk. Recent data suggest that the US arsenal totals 9,400 warheads while the Russian is 13,000.⁴

However, the biggest problem is that continuing disagreement between the two governments has meant that even the modest proposals on offer have yet to be turned into a formal treaty. This disagreement can be summed up in two words: Missile Defence. In September, the US made a very welcome announcement that the proposed US Missile Defence installations in Poland and Czech Republic were to be cancelled. Although these installations had long been claimed to be for tackling an Iranian nuclear missile threat, the Russians had seen them as a threat to their national security, and this had stalled disarmament talks. The September announcement allowed further progress to be made, but the US's insistence that a revised Missile Defence system should still be deployed (albeit one closer to Iran) has continued to make the Russians suspicious (see p?).

Uncertainty in the UK

Meanwhile, uncertainty has been the order of the day concerning nuclear weapons in the UK. Although a 2008 investigation by the Federation of American Scientists concluded that the last US nuclear bombs stationed in Britain had probably been removed,⁵ there has still been no official confirmation of this. To compound the confusion, the widely expected announcement – due last September – that the Trident replacement programme would move to its next phase of development – known as the 'initial gate' decision – failed to occur.⁶ However, one announcement that Gordon Brown did make was that his government would seriously consider reducing the number of new submarines built to carry nuclear missiles from four to three – although this really only repeated existing government policy.

Progress and setbacks elsewhere

Two very positive developments during 2009 were the entry into force of two new Nuclear Weapons Free Zones in central Asia and Africa.⁷ This means that more than half of the world's land area now falls within one of these zones.

Meanwhile, Germany, Belgium and the Netherlands called for all remaining US nuclear weapons to be removed from Europe, and for NATO to downgrade the importance of nuclear weapons in its security

stance.⁸ Support for such ideas has also come from other voices in Europe.

However, other events have been a source of serious concern. North Korea's explosion of a small nuclear device last April threatened to upstage Obama's Prague speech. Iran's admission that it has a secret enrichment facility drew widespread condemnation. The Taliban insurgency in Pakistan has led to fears over the security of their nuclear weapons. And one should not forget the continuing silence among officials over Israel's nuclear arsenal.

On the road to the NPT review conference

With the next NPT review conference to be held in May, it is critical that the disarmament momentum is continued. At the very least, the US and Russia need to agree the proposed new treaty and declare a major downgrading of nuclear weapons in their security architectures. There also needs to be a commitment by the US to remove its nuclear weapons from Europe. The UK and France need to come forward with major disarmament proposals. And we need the other nuclear powers to come forward with commensurate proposals.

Action

Please sign the following online petitions:

- INES petition: 'Scientists for a nuclear weapons-free world' at <http://www.inesglobal.com/campaigns.phtml>
- CND petition: 'No Trident Replacement - Yes to a Nuclear Weapons Convention' at <http://www.iparl.com/petition-cnd/>

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Making space for peace - preventing Missile Defence expanding warfare

Philip Chapman argues that international law on the military use of space still needs urgent attention, despite recent announcements from the Obama administration.

The world's most powerful military forces are today heavily reliant on technologies that utilise space, but the use of space by the military is almost as old as the space age itself, beginning with the launch of the first US spy satellites in the years following Sputnik 1. The most dangerous and destabilising current military use of space is the US Ballistic Missile Defence System (BMDS), which has started a new arms race, threatens to produce a new arena of warfare and presents an impediment to wider disarmament efforts. Despite the recent announcement by the Obama administration to abandon Bush era plans for interceptors and radar installations in Poland and the Czech Republic, the programme remains extensive and is expanding. This makes new treaty arrangements for space an international priority.

Integrated Missile Defence

Until 2002 the BMDS designed to shield the entire US landmass from ballistic missile attack was known as National Missile Defence. This distinguished it from more mobile 'theatre' missile defences, such as Theatre High Altitude Area Defense (THAAD) and Aegis ship based BMD. In 2002, under the newly

named Missile Defence Agency (MDA), the distinction was blurred, with the MDA now talking of integrated, tiered or layered missile defence encompassing all programmes (Figure 1).

The UK role

In accordance with its customary role in the 'special relationship,' the UK government has at all stages in the Missile Defence programme signalled its willingness to do whatever the US military asks of it. As of August 2007 an upgrade to add missile tracking capabilities to the phased array Ballistic Missile Early Warning Radar at RAF Fylingdales has been operational. At RAF Menwith Hill (Figure 2) the relay ground stations have been built in anticipation of the much delayed and grossly over budget Space-Based Infrared Systems. Just one of these programmes, called SBIRS High and consisting of geosynchronous and highly elliptical orbiting satellites, is now estimated to cost \$12 billion, with the contracts mostly going to Lockheed Martin.¹

First strike weapon

Missile Defence is intended to nullify the deterrent capabilities of potential adversaries. In the words of the Rand Corporation "ballistic missile defense is not simply a *shield* but an *enabler* of US action".² Russia and China therefore regard BMDS as a weapon with the potential to nullify any response of theirs to a US first strike.³ Bush era policy demanding "no final,

fixed missile defense architecture," but an ever "evolving" and "expanding" BMDS reinforced this view.⁴ While Russian objections have come to the fore in recent years, the Chinese were the strongest opponents prior to the US withdrawal from the Anti-Ballistic Missile (ABM) treaty and prior to installations in eastern Europe being proposed. As the US was about to withdraw from the ABM treaty, Chinese experts spoke of a decade's failure to "stiffen the Russian spine." China has responded in ways long predicted, such as with the development and testing of anti-satellite weapons.²

The first war in space - maybe the last?

The Chinese successfully tested an anti-satellite weapon on 11 January 2007, destroying an old weather satellite and creating the "most severe orbital debris cloud in history".⁵ This test has created 2,317 pieces of orbiting debris large enough to be tracked by NASA (larger than 10cm) and over 35,000 pieces between 1cm and 10cm.⁶ It is estimated that destroying bigger satellites could create 250,000 pieces large enough to track.⁷ Coupled with a 'cascading effect' even a relatively limited attack on objects in low earth orbit could severely limit peaceful uses of this orbital belt, or at least make necessary expensive and restrictive protective measures.⁸ Having argued for years for the banning of such weapons, this action by China should be seen as an attempt to persuade the US that a ban is in its interests.

Law in space

The foundation of international law governing space is the Outer Space Treaty of 1967. It states: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries... and shall be the province of all mankind." It goes on to say, "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." It specifically bans the placement in space of weapons of mass destruction and forbids military installations on celestial bodies.

Clinton era talk of 'control,' 'dominance' and 'denial' of space,⁹ as well as Bush era claims of effective ownership, clearly violate the spirit of the Outer



Figure 1. Components of Missile Defence.

Feature Articles

Space Treaty. However existing legal arrangements leave much unspecified; urgent action is required to contain expansionist military ambitions.

PAROS

On the 29 May 2009, due to the change of power in Washington, the UN Conference on Disarmament (CD) agreed upon a programme of work for the first time in twelve years. It included a provision to discuss a 'Prevention of an Arms Race in Outer Space' (PAROS) agreement. Russia and China have long been keen proponents of such an agreement and submitted a joint draft treaty in 2008. However, as implementation of the programme has stalled, it remains to be seen whether the Obama administration is willing to negotiate on all four 'core issues' of the CD, including PAROS, and not solely a Fissile Material Cut-off Treaty (for controlling nuclear materials).¹⁰

Nuclear disarmament

A new bilateral agreement between Russia and the US to further reduce nuclear warheads ('New Start') is almost certain to be agreed in the coming months. However, the goal of a world without nuclear weapons, the desire for which has won President Obama the Nobel peace prize, requires action by the US that has yet to be signalled. As the Russian ambassador to the UN stated on the 8 October 2009, "It is hard to imagine a situation in which a significant reduction of nuclear arms is made simultaneously with missile defence build-up, designed to give military advantage to one of the parties."¹¹ While the Chinese expand and modernise their nuclear arsenal to ensure the ability to respond to a first strike, it is clear that nuclear weapons states, dwarfed by the conventional military might of the US, will require wider international arms control and peace agreements to consider dismantling their nuclear weapons. Guarantees of peace in space will be a necessary part of this architecture.

A role for SGR?

Having been in a moribund state for years, the Conference on Disarmament has regained the potential to play a central role in the coming years in creating a more peaceful future. The CD annual report 2009 reported that "several delegations reiterated their hope of enhanced civil society engagement in the work of the Conference." There is every reason why SGR should be among those engaging with this work.

Yorkshire
CND



Figure 2. Menwith Hill from the air.

Conclusions

To conclude:

- Advocates for nuclear disarmament and strategic arms reduction need to address Missile Defence development and fears of the weaponisation of space by also advocating for new international agreements limiting their development. A PAROS agreement must at the very least prevent the placement of weapons in space and the targeting of objects in space.
- The scrapping of plans for interceptor missiles in Poland and radar in Czech Republic could simply be, as the Pentagon says it is, a purely technical decision and could in fact lead to operational interceptor missiles being sited in Europe earlier than the original scheme. Obama is yet to move beyond and alter the Bush administration's space policy.
- EU states and concerned parties should emphasise the importance of all four core issues at the Conference on Disarmament, namely nuclear disarmament, negative security assurances, a Fissile Material Cut-Off Treaty, and PAROS.

Philip Chapman has had a long-standing interest in the issues surrounding Missile Defence. He is currently studying at the National Oceanography Centre at Southampton University.

This article is based on a poster presented at the SGR conference 2009.

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The artist and technologist in the aftermath of Chernobyl

Poet, essayist and scientist Mario Petrucci brings an artist's perspective to the challenge of understanding the shadow side of our post-enlightenment, industrial culture, using the nuclear disaster at Chernobyl as a point of focus. Making a personal connection with such events is crucial, he says; and art makes an important contribution to that process.

Our best artists often probe those places in the body politic where the skin is thinner, where knowledge can more successfully creep through – as the pulse does, at the wrist. Great art takes the complex pulse of a culture. As an active ecologist and lapsed physicist, I sense that interfaces (like the skin) – such as those between art and ecology, or art and science, or art and war – hold key 'alertness nutrients' for our world. (Think of potatoes: we know the skins are good for us.) The first calling of the artist, and any individual, must be to open the self to interfaces: to embrace empathy and sensitivity and to be receptive to support and challenges from either side.

Nuclear energy is evidence of immense creativity; but creativity, we know, has its negative incarnations. Psychology teaches us that these negative incarnations come about through failing to engage the entire self. We must respond to Chernobyl fully and personally if sustainable and sustaining collaborations and activities are to be discovered.

This fuller self is not to be confused with an enlarged ego; nor should it be dismissed as inappropriate within 'pragmatic' organisations. As Dostoevsky shows us, humans must have a point at which they stand against the culture and positively assert the self. Art can help us to access that self, can assist us in transcending formalities so that we operate more powerfully than with scientific efficiency alone. It inoculates us against the temptation to short-circuit the self and sink our responsibility and vitality entirely into the formal, the technological, the industrial response.

Konrad Lorenz wrote: "I believe I've found the missing link between animal and civilized man. It is us." This is nowhere more evident than in our love-hate relationship with industry. I am narrowing my eyes, of course, in the direction of the nuclear industry – but not that industry alone. David Bohm, the great philosopher and radical scientist, wrote: "We now have the entertainment industry, and practically have

a culture industry and an education industry; similarly, we... have the nature industry." The environment too is becoming an industry. To address Chernobyl, or our environment, without first unravelling this preoccupation with industries is rather like entering the Minotaur's labyrinth without Ariadne's thread. Britain is now toying with a vision of nuclear stations studded along its coasts, black as flies around a rind, while no less in thrall to oil. To assert the self and transcend this preoccupation, it can help to look at how our artists are responding to the issue.

Meanwhile, industrialised and industrialising nations still behave largely as though the environment were 'out there'. Even Einstein's promising definition of the environment as "Everything that isn't me" is, on closer inspection, flawed. Why not "The environment is everything, *including* me"? Art offers a crucial way in which we can imagine that inclusion (or exclusion). Remember, everything we create is an extension of our imagination; indeed, industry and commerce are every bit as adept at creating powerful myths as the bard, novelist or film-maker.

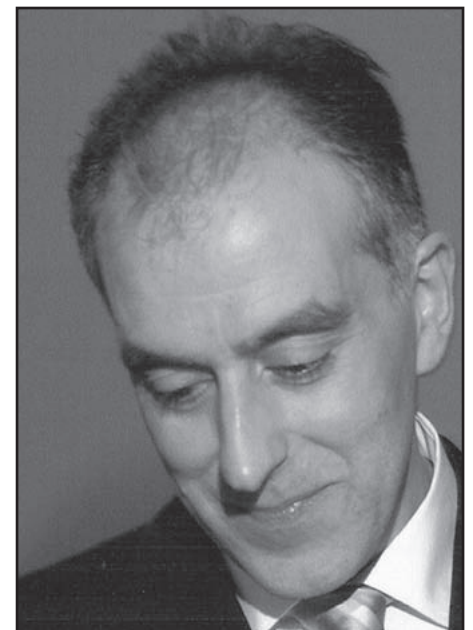
In a profound sense, then, Chernobyl isn't merely something that went wrong or that happened *to* us, but a material expression of the collective imaginative self. This is why the scientific quantification of Chernobyl and its after-effects is only part of the story. One of the chief outcomes of Chernobyl will be what we allow it to tell us about ourselves, as an expression of our negative imagination and its myths.

In understanding Chernobyl, therefore, intellect only provides one tool. Einstein remarked: "We should take care not to make the intellect our God". I'd extend that warning to rhetoric. But if not intellect or rhetoric, what then? Perhaps it's a fundamental truth that suffering – and a genuine empathy with suffering – can re-orient us in a better direction. Chernobyl is far more than a scientific mistake or a folly of Soviet zeitgeist; more, too, than yet another increment in our capacity to generate tragedy and environmental stress. On some plane – one that is more instinctive, and felt, than arcane – Chernobyl can help transform the view of progress as an economic-scientific parameter to one more positively concerned with human values rooted in compassion.

I'm not negating here the many ways in which Chernobyl has already stirred up a challenge to its

underpinning technology; nor is it lost on me that I'm among the world's beneficiaries of industrialism. But the story of knowledge and its suffering is, in the end, all one story. We are all protagonists in it: individuals, organisations, nations – even industries. We can allow Chernobyl to demonstrate the supremacy of negative imagination, or we can repossess our potential to meet it with wisdom. As Karl Barth reminds us, the immense 'Yes' of Mozart's music has potency precisely because it encompasses and overwhelms a 'No'. As Montaigne reminds us, we have both that Yes and that No within us: "I have never seen a greater monster – or miracle – in the world than myself".

Art may not be immune from co-option into servicing the 'Noes' of technological or economic activity; but it can also overwhelm and transcend them, engaging fully the 'Yes' of imaginative human spirit and profoundly informing its technological stance. There is still time to choose.



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Resources

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Assessing sustainable population levels

Andrew Ferguson uses ecological footprinting and carbon budgets to estimate sustainable population levels for the UK and elsewhere and comes to some disturbing conclusions.

Several indicators can be used to estimate the sustainability of human society. Two of the most important are the 'ecological footprint' and carbon emissions, both of which give an assessment of human impact on the world's ecosystems and the global climate system.

Ecological footprint (or eco-footprint) data is available in the *Living Planet Report*¹ (LPR) published biennially by WWF, while carbon emissions data are available from the Energy Information Agency.² Both can provide a powerful insight into the extent to which adjustments need to be made in the size of per capita footprints, emissions and population level to bring these down to sustainable levels. This article presents data for the UK (Figure 1) and the European Union (Figure 2), and outlines a number of caveats which need to be considered in the interpretation of the eco-footprint data. It also takes a brief look at the situation in the USA.

The first caveat relates to biocapacity, which needs to match the size of the ecological footprint to ensure sustainability; but it is also necessary that

the yield (of a given crop), which determines that biocapacity, is sustainable. Agriculture in Europe is probably more sustainable than in many parts of the world. Europe is not drawing down its water tables, desertification and soil erosion are at a modest level, and the pollution of water supplies is under a degree of control. However, high crop yields are dependent upon the widespread use of artificial fertilisers, based on fossil fuels, and these are becoming depleted. Nevertheless, the eco-footprinting data for Europe is still relatively robust in this area.

In contrast, it is hopelessly misleading to assess many other parts of the world without first considering the problems of sustainability. A lot of so-called biocapacity in the United States is only there temporarily – cultivation methods are such as to cause soil erosion, contamination of water supplies by fertilisers, and the drawing down of aquifers. Thus eco-footprinting can only be applied to the USA after the most careful consideration of the sustainability of the biocapacity.

Another caveat concerns 'fishing grounds' which are considered both part of the eco-footprint and part of biocapacity. But there is major doubt whether commercial fishing is sustainable, so it might be wise to exclude fishing grounds as available biocapacity.

Nevertheless this has not been done in these figures. A further caveat regarding eco-footprinting relates to built-up land, as the biocapacity of built-up land is normally rated as equivalent to arable land in the assessment. However, this problem only has a large impact on the figures when there are substantial changes in population, and so is currently a relatively minor distortion. To preserve standardisation, built-up land has still been included in the calculations used to produce Figures 1 and 2.

A substantial further caveat is that no allowance has been made to preserve biodiversity. The Brundtland Commission, which in 1987 might be said to have started the political discussion on sustainability, suggested 12% of biocapacity needed to be set aside. I have seen it suggested by some ecologists that 30% would be more appropriate. Taking that as an example, 30% would reduce the sustainable populations calculated below by 30%.

These various caveats provide an adequate explanation for why somewhat different figures emanate from eco-footprinting, and why the populations shown are usually too high rather than too low. But the caveats do not disturb the essential message, which remains clear. Figure 1 shows that, with the present footprint per person of 5.6 global hectares (gha),³ the UK would need to reduce its

Figure 1

Relationship between Ecological Footprint and sustainable population, and 'safe' CO₂ emissions and sustainable population for United Kingdom

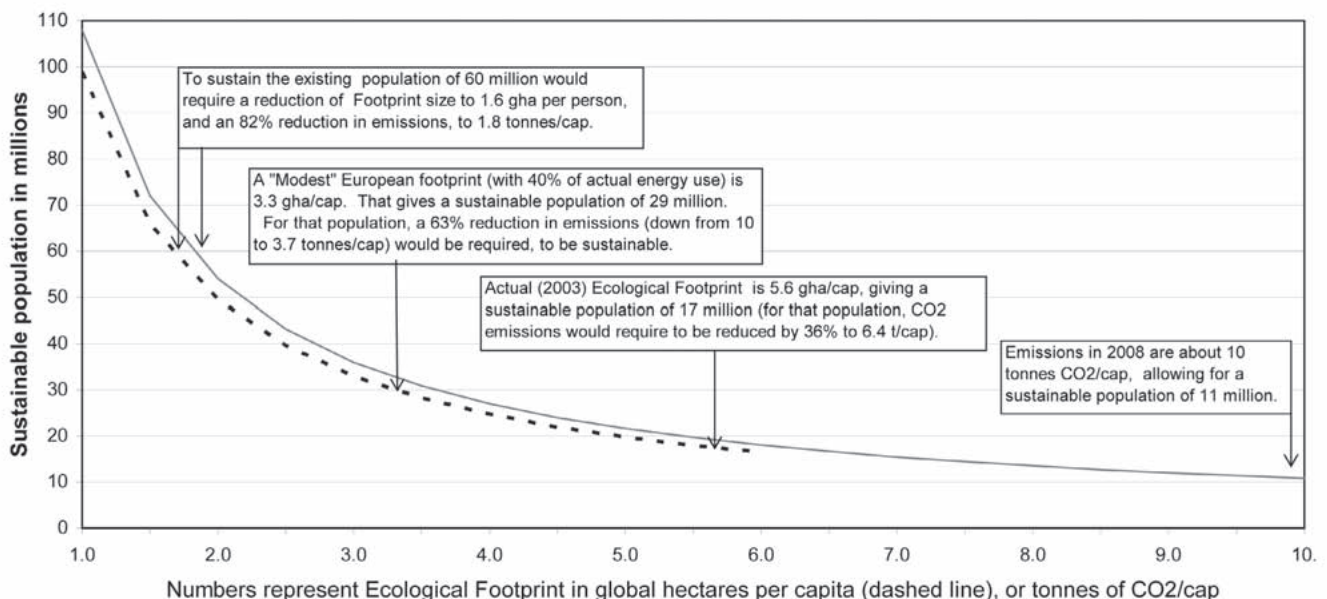
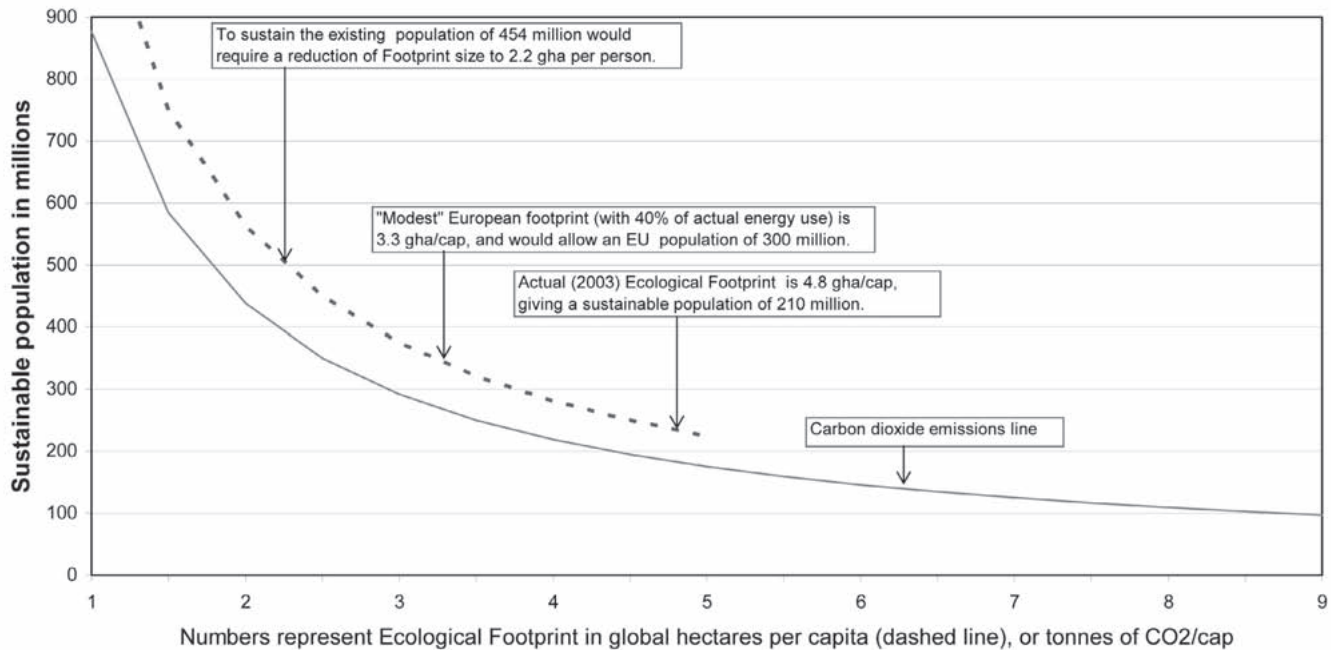


Figure 2

Relationship between Ecological Footprint and sustainable population for the European Union



Sustainable populations XLS

Optimum Population Trust

population to about 17 million to be sustainable according to eco-footprinting.

The problem of excessive carbon dioxide emissions requires even more draconian cuts. With current carbon dioxide emissions, about 10 tonnes per person, the UK population would need to be reduced to 11 million in order that the UK should emit no more than its fair share of the emissions which the world could emit (9,000 million tonnes per year⁴) and still have some hope of stabilising carbon dioxide concentration at a safe level.

Alternatively the UK could support its present population of about 60 million if it were to reduce its per capita footprint from 5.6 gha/cap to 1.6 gha/cap and cut its carbon dioxide emissions by 82%. Given the current outlook, the probability of it doing either is not high. A target closer to reality is an average European footprint in which energy use has been reduced to about 40% of current energy use (the average that is actually used is for Western Europe in 2001). This is what the Optimum Population Trust calls a 'Modest' European footprint; its size is 3.3 gha/cap. If the UK population could reduce the average per capita footprint to that Modest European footprint size, then its sustainable population would be 29 million according to this particular analysis (as

noted, more stringent analyses taking account of soil sustainability and preservation of biodiversity would be more valid).

It is a moot point whether heavily overpopulated nations like the UK and the Netherlands need to adjust their populations (and lifestyles) to plan for future sustainability, or whether they can share that burden of population reduction with those parts of the European Union which are less heavily overpopulated. Figure 2 covers the 22 countries of the EU listed in the 2006 edition of the LPR. Those countries had (in 2003, the data-year for LPR 2006) an ecological footprint of 4.8 gha/cap, giving a sustainable population of 210 million. That is about half of the 2003 population of 454 million. However, if Europeans succeed in reducing their per capita footprint to the Modest European level, then the EU could support 300 million, which would be 66% of its 2003 population.

Turning to the USA, its eco-footprint was 9.6 gha/cap in 2003. A sustainable population at that level would be about 145 million – around half the current level. And based on current carbon emissions, the sustainable population would be less than 10% of the existing level. There is much potential for the USA to reduce both per capita carbon emissions and the size

of per capita eco-footprints, but bearing in mind the caveats above of sustainability, the imbalance is likely to be hard to address.

Andrew Ferguson is the editor of the Optimum Population Trust Journal.

Notes and references

1. Data from the 2006 edition of the LPR are used here, but the results using the 2008 edition are very similar. For further details, see: http://www.panda.org/about_our_earth/all_publications/living_planet_report/
2. One example of the tables provided by the Energy Information Agency can be found at: <http://www.eia.doe.gov/pub/international/iealf/tableh1cco2.xls>
3. A 'global hectare' refers to a hectare of land with temperature, sunshine, rainfall and soil fertility such that it is able to produce an average amount of biomass per year. Thus the UK has more global hectares than hectares, but in the Canadian prairies, for instance, the situation is reversed. Thus the number of global hectares in the world equals the actual number of hectares. Note also that 1 hectare = 10,000 m² = 2.47 acres.
4. Engelman R (1994). *Stabilizing the Atmosphere: Population, Consumption and Greenhouse Gases*. Population Action International, 48 pp. In this excellent booklet, Engelman calculated 8.9 gigatonnes (Gt) on the basis of IPCC's indication of a need to reduce emissions to 20%-40% of the then current level of 22.3 Gt/y. Subsequent IPCC indications have suggested lower figures.

Stop selling out science to commerce

Stuart Parkinson and Chris Langley

Do commercial pressures have a negative impact on science? This debate has been raging for so long that it usually raises little more than a shrug of indifference.

That is no longer a defensible response. A new report¹ from our organisation, Scientists for Global Responsibility (SGR), exposes problems so serious that we can no longer afford to be indifferent to them.

The report looks at the impact of five commercial sectors on science and technology over the past 20 years. The damaging influence of two of these, pharmaceuticals and tobacco, has been noted before. But we also looked at the oil and gas, defence and biotech sectors, which have been subjected to less scrutiny.

We found a wide range of disturbing commercial influences on science, and evidence that similar problems are occurring across academic disciplines.

Over the past two decades, government policy in the US, UK and elsewhere has fundamentally altered the academic landscape in a drive for profit. Universities have been pushed to adopt a much more commercial mindset, from taking out patents to prioritising research that promises short-term economic gains. The rapid spread of partnerships between businesses and universities has led to some disciplines becoming so intertwined with industry that few academics are able to retain their independence.

Chemical engineering and geology are strongly linked to oil companies, for example, and it is hard to find an engineering department in the UK which does not receive funding from the arms industry. And many life sciences departments have extensive links with the biotechnology and pharmaceutical industries.

This creates enormous potential for conflicts of interest. The problem has long been recognised in medical research, and journals are starting to crack down on it, but in other disciplines the problems are rarely even discussed, let alone acted upon.

Such problems are a major concern because they can undermine the quality and reliability of research. This is perhaps best illustrated by "sponsorship bias", where research generates results that suit the

funder.² Another well-documented problem is the failure to report results unfavourable to the funder.

Research is also undermined by misleading messages put out by industry-funded lobby groups. Again, these tactics are well known from the tobacco and oil industries, with their deliberate questioning of health research and sponsorship of climate sceptics. Less attention has been given to the funding of some patient groups by pharmaceutical companies and the (sometimes covert) use of PR companies by the biotechnology industry in the debate over genetically modified crops. This does not bode well for public discussions on the risks of synthetic biology.

Another cornerstone of science that is being eroded is the freedom to set the public research agenda so that it serves the public interest. Governments are increasingly focused on delivering competitiveness, and business interests are able to exert pressure on funding bodies through representatives on their boards. As a result, environmental and social problems and 'blue-sky' research commonly lose out to short-term commercial gain.

For example, genetics now dominates agricultural science, not least because genetic technologies are highly patentable. This not only dominates privately funded research, but also steers publicly funded research away from work that takes a different approach or explores low-tech solutions.

As a result, 'low-input' agriculture, which requires minimal use of chemical fertilisers and pesticides and is cheaper and more useful to poorer farmers, is largely overlooked. Similarly, research on how to improve food distribution receives inadequate support.

Another example is research on security issues, which is overwhelmingly focused on new military technology. Research into understanding the roots of conflict, or to support negotiation and reconciliation programmes, receives a tiny fraction of the tens of billions of dollars spent globally on developing military hardware. And most of that is public money.

Put bluntly, much publicly funded science is no longer being done in the public interest. Despite this, policy-makers are complacent and argue that any damaging effects of commercial influence are minor.

In contrast, many scientists are noticing the effects and becoming discomfited by them. Some are starting to speak out. For example, staff at the Open

University in the UK are pushing for new ethical standards for business partnerships following the university's involvement in a major military contract.

However, these campaigns are few and far between. There is a strong incentive for scientists not to make a fuss if their department receives industry funds. This is strengthened by contractual requirements for secrecy that often come with industry partnerships.

To defend independent science, reform is needed, from the level of government policy down to that of the research study. To this end, SGR is making recommendations. These include: the open publication of all funding arrangements between academia and business; ethical standards for business-university partnerships; proper handling of conflicts of interests by journals; more involvement of the public in setting research priorities; and a change in government policies which prioritise research with short-term commercial priorities above all else.

Scientists must now voice their concerns publicly in order that policy-makers hear them. They could do worse than follow the example set by campaigners at the Open University.

Dr Stuart Parkinson and Dr Chris Langley are authors of the SGR report, Science and the Corporate Agenda.

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Open ethics – a call for university commitment to ethical partnerships

A staff group at the Open University is proposing an ethical strategy for the development of external partnerships, which would include a severing of the institution's links with the arms industry.

Funding crisis

The Open University (OU), the UK's largest provider of part-time distance higher education, faces big cuts over the next three years due to the implementation of the government's Equivalent and Lower Qualification (ELQ) policy.

In response, OU management is expanding income-generating activities from external partnerships and exploring the feasibility of international expansion. Some staff however fear this response is unfocussed and in danger of damaging the university's long-established commitment to social justice.

The Metrix connection

Such fears have been fuelled by the university's involvement in the Metrix consortium, which has been established to win the government contract to part-privatise all military training in the UK. The contract is the largest private finance initiative seen in Britain, valued at £10-12 billion.

But the consortium involves the OU partnering Metrix members such as missile manufacturer, Raytheon and Qinetiq, the military research company that was controversially privatised out of the Ministry of Defence's R&D labs.

Staff concerns about such links have been further heightened by the lack of information regarding the role that the OU is playing within the Metrix consortium. This is seen as indicative of the secrecy that surrounds military projects, at the expense of academic openness.

Alternative strategy

But rather than just campaigning against such partnerships, a staff group at the OU has been set up to be pro-active in proposing an alternative.

A spokesperson for the group said, "Rather than dealing with external partnerships on a 'scatter gun' basis, making links opportunistically, we felt the OU needed a focused approach. After all, like many universities, the OU has spent a great deal on re-branding. Yet effective branding demands conscious choices about which 'partnerships' to seek out and which to avoid. That is the

essence of both organisational strategy and effective marketing. We couldn't, and still can't, see any coherent and considered approach to partnerships from the university's management that fits in with a 'high quality, social justice' brand. Instead, it seems to be based on a 'let's get in with the big corporations' approach. There don't seem to be too many social justice aspects to that."

Model strategy

The group consequently put forward an 'ethical partnership strategy' but rather than re-invent the wheel, they decided a successful model already existed — that used by the Co-operative Bank.

A report by War On Want had already pointed out that the Co-op Bank was the only high street bank to have a written ethical lending policy *and* to have implemented it in practice. This includes a refusal to invest in companies that "manufacture and/or sell systems or products that kill, maim or destroy". The policy has proved commercially very successful for the bank.

The OU staff group adopted the Co-op Bank policy and set out the ethical partnership guidelines that the university could adopt regarding the arms trade, animal welfare, ecological awareness, human rights and corporate responsibility. They used it as the basis of a report to management, via the University and College Union branch.

Initially, the then Vice Chancellor appeared to recognise the need for an 'ethical partnership framework' but no definite proposals have been forthcoming from OU management as to what this framework might mean.

With the recent appointment of a new VC, Martin Bean (formerly of the educational wing of Microsoft) the staff group now hope management will take a fresh look at the approach they advocate.

"There are signs that the new VC is bringing a breath of fresh air into the Open University" said the staff group spokesperson, "and he has already spoken on several occasions about the university's commitment to social justice. Now we'd like to see our ethical partnership approach explored as part of that commitment".

**The OU Ethical Partnership Group can be contacted at:
<altstratgroup@googlemail.com>**

Letters

Letters to the editor should be sent to <newsletter@sgr.org.uk>. It is recommended that they should not be longer than 250 words. They may be edited for brevity or clarity.

Low energy debate

In addition to the low carbon energy debate (SGR newsletter, 37), I feel there needs to be a low energy debate because without addressing the fundamental fact that nothing can completely replace the fossil fuels, and in particular oil, for the energy and raw materials they provide, we will not design a system fit for the future.

Nick Reeves rightly points out that everything we do alters the environment and thanks to hundreds of years of 'progress', we now face a perfect storm of climate change, resource depletion, loss of biodiversity, soil erosion, lack of fresh water and population growth. Despite the continued melting of ice sheets and other climatic evidence, arguments still rage not just over whether global warming is caused by human activity, but whether it is happening at all! If we cannot agree on what the problem is, how can we ever hope to agree on the solution?

If we compare the talk to the action, we see governments bailing out banks but being unable to invest in real energy efficiency improvements, such as insulation for all. We see faith being put in electric cars or biofuels but no moves to reduce travel. Oil allowed globalisation but there is no debate about how a global system could function without oil. And if we don't make that transition, it will be imposed on us by nature.

Dr Mandy Meikle, West Calder, West Lothian

Universities: from knowledge to wisdom

Nicholas Maxwell argues that the growth in academic work devoted to policy issues could mark the beginning of a shift from 'knowledge-inquiry' to 'wisdom-inquiry', leading to importance benefits for society.

For over 30 years I have argued that, for both intellectual and humanitarian reasons, we urgently need a revolution in the aims and methods of academic inquiry. Instead of giving priority to the search for knowledge, academia should devote itself to seeking and promoting wisdom by rational means – wisdom being the capacity to realise what is of value in life, for oneself and others. Wisdom thus includes knowledge but much else besides. I argue that the fundamental task of academia should be to help humanity learn how to create as good a world as possible.¹

The case for wisdom

Acquiring scientific knowledge dissociated from a concern for wisdom, which we do at present, is dangerously and damagingly irrational.

Natural science has been extraordinarily successful in increasing knowledge. This has been of great benefit to humanity. But new knowledge and technological know-how increase our power to act, which, without wisdom, can and does cause human suffering and death as well as human benefit. Indeed all our modern global problems have arisen in this way: climate change, the destruction caused by modern war and terrorism, vast inequalities of wealth and power round the globe, overpopulation, rapid extinction of other species. All these have been made possible by modern science dissociated from the rational pursuit of wisdom.

If we are to avoid in this century the horrors of the last one, we urgently need to learn how to acquire more wisdom, which in turn means that our institutions of learning become devoted to that end.

The revolution we need would change every branch and aspect of academic inquiry. A basic intellectual task of academic inquiry would be to articulate our problems of living (personal, social and global) and propose and critically assess possible solutions, possible actions. This would be the task of social inquiry and the humanities. Tackling problems of knowledge would be secondary. Social inquiry would be at the heart of the academic enterprise, intellectually more fundamental than natural science. On a rather more

long-term basis, social inquiry would be concerned to help humanity build cooperatively rational methods of problem solving into the fabric of social and political life, so that we may gradually acquire the capacity to resolve our conflicts and problems of living in more cooperatively rational ways than at present. Natural science would change to include three domains of discussion: evidence, theory, and aims – the latter including discussion of metaphysics, values and politics. Academic inquiry as a whole would become a kind of people's civil service, doing openly for the public what actual civil services are supposed to do in secret for governments. Academia would actively seek to educate the public by means of discussion and debate, and would not just study the public. Universities would have just sufficient power to retain their independence from government, industry, the media, public opinion, but no more.

These changes are not arbitrary. They all come, I have argued, from demanding that academia cures its current structural irrationality, so that reason – the authentic article – may be devoted to promoting human welfare.²

The rise of policy-orientated research centres - a quiet revolution?

My efforts to start up a campaign to transform academia so that it becomes an educational resource to help humanity learn how to create a better world have not met with much success. I am not aware of any discipline, or any department in any university, that

has changed as a result of my work. Few academics have even heard of my work. Even philosophers seem to be, by and large, ignorant of it, or indifferent to it – especially disappointing in view of the fact that the argument for the intellectual revolution is profoundly philosophical in character. And not just the argument: the outcome, the new conception of inquiry I argue for – *wisdom-inquiry* as it may be called – is, I claim, quintessentially philosophical in that it is the solution to a profoundly significant philosophical problem, namely: *What kind of inquiry can best help us make progress towards a civilised world?*

Viewed from another perspective, however, my call for a revolution, for the implementation of *wisdom-inquiry*, has been astonishingly successful. During the last 10-20 years, numerous changes have occurred in academia that amount to a shift towards wisdom-inquiry – whether or not in response to any of my work. In what follows I concentrate on universities in the UK.

Perhaps the most significant of these steps is the creation of departments, institutions and research centres concerned with social policy, environmental degradation, climate change, poverty, injustice and war, and other matters such as medical ethics and community health.

At Cambridge University, for example, one can see the first hints of the institutional structure of wisdom-inquiry being superimposed upon the existing structure of 'knowledge-inquiry' (as inquiry organised around the pursuit of knowledge may be called). As I



have indicated, wisdom-inquiry puts the intellectual tackling of problems of living at the heart of academic inquiry, this activity being conducted in such a way that it both influences, and is influenced by, more specialised research. Knowledge-inquiry, by contrast, organises intellectual activity into the conventional departments of knowledge: physics, chemistry, biology, history and the rest, in turn subdivided, again and again, into increasingly specialised research disciplines. But this knowledge-inquiry structure of ever more specialised research is hopelessly inappropriate when it comes to tackling problems of living. In order to tackle environmental problems, for example, in a rational and effective way, specialised research into a multitude of different fields, from geology, engineering and economics to climate science, biology, architecture and metallurgy, needs to be connected to, and coordinated with, the different aspects of environmental problems.³ The sheer urgency of environmental problems has, it seems, forced Cambridge University to create the beginnings of wisdom-inquiry organisation to deal with the issue. The 'Cambridge Environmental Initiative' (CEI), launched in December 2004, distinguishes seven fields associated with environmental problems: conservation, climate change, energy, society, water waste built environment and industry, natural hazards, society, and technology, and under these headings, coordinates some 102 research groups working on specialised aspects of environmental issues in some 25 different (knowledge-inquiry) departments.⁴ The CEI holds seminars, workshops and public lectures to put specialised research workers in diverse fields in touch with one another, and to inform the public.

A similar coordinating, interdisciplinary initiative exists at Oxford University. This is the School of Geography and the Environment, founded in 2005 under another name. It is made up of five research 'clusters': two previously established research centres, the Environmental Change Institute (founded in 1991) and the Transport Studies Institute, and three inter-departmental research programmes, the African Environments Programme the Oxford Centre for Water Research, and the Oxford branch of the Tyndall Centre (see below). The School has links with other such research centres, for example the UK Climate Impact Programme and the UK Energy Research Centre.

Similar developments have taken place recently at my own university, University College London. Not only are there 141 research institutes and centres at

UCL – some only recently founded, many interdisciplinary in character, devoted to such themes as ageing, cancer, cities, culture, public policy, the environment, global health, governance, migration, and security – but, in addition, very recently, the attempt has been made to organise research at UCL around a few broad themes that include: global health, sustainable cities, intercultural interactions, and human wellbeing. This is being done so that UCL may better contribute to solving the immense global problems that confront humanity.

These developments, echoed in many other UK universities, can be regarded as first steps towards implementing wisdom-inquiry.

Equally impressive is the John Tyndall Centre for Climate Change Research, founded by 28 scientists from ten different institutions in 2000. It is based in six British universities, has links with six others, and is funded by three research councils: the Natural Environment Research Council (NERC), the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC). The centre "brings together scientists, economists, engineers and social scientists, who together are working to develop sustainable responses to climate change through trans-disciplinary research and dialogue on both a national and international level [including] [...] with business leaders, policy advisors, the media and the public in general".⁵ It is clear from the centre's own account⁶ that innovations in its work are strikingly in accordance with basic features of wisdom-inquiry. We have here, perhaps, the real beginnings of wisdom-inquiry being put into academic practice.

A similar organisation, modelled on the Tyndall Centre, is the UK Energy Research Centre (UKERC), launched in 2004, and also funded by NERC, EPSRC and ESRC. Its mission is to be a "centre of research, and source of authoritative information and leadership, on sustainable energy systems".⁷ The UKERC coordinates research in some twelve British universities or research institutions and has also launched the National Energy Research Network (NERN), which seeks to link up the entire energy community, including people from academia, government, non-governmental organisations and business.

Another possible indication of a modest step towards wisdom-inquiry is the growth of peace studies and conflict resolution research. In the UK, the Peace



Studies Department at Bradford University has quadrupled in size since 1984,⁸ and is now the largest university department in this field in the world. INCORE, an International Conflict Research project, was established in 1993 at the University of Ulster in Northern Ireland, in conjunction with the United Nations University. It develops conflict resolution strategies and aims to influence policymakers and others involved in conflict resolution. Like the newly created environmental institutions just considered, INCORE is highly interdisciplinary in character, in that it coordinates work across the traditional knowledge departments of history, policy studies, politics, international affairs, sociology, geography, architecture, communications and social work as well as in peace and conflict studies.

Peace studies have also grown during the last two decades at Sussex University, Kings College London, Leeds University, Coventry University and London Metropolitan University. Recently created UK centres in the field include the Centre for Peace and Reconciliation Studies at Warwick University; the Desmond Tutu Centre for War and Peace at Liverpool Hope University; the Praxis Centre at Leeds Metropolitan University; the Crime and Conflict Centre at Middlesex University; and the International Boundaries Research Unit at Durham University.⁹

There are further indications of a general movement towards aspects of wisdom-inquiry. Demos, an independent UK think tank has, in recent years,

convened conferences on the need for more public participation in discussion of the aims and priorities of scientific research and greater openness of science to the public.¹⁰ This has been taken up by the Royal Society, which, in 2004, published a report on the potential benefits and hazards of nanotechnology produced by a group consisting of both scientists and non-scientists. The Royal Society also created a 'Science in Society Programme' in 2000, with the aims of promoting "dialogue with society", of involving "society positively in influencing and sharing responsibility for policy on scientific matters", and of embracing "a culture of openness in decision-making" which takes into account "the values and attitudes of the public".

A similar initiative is the 'science in society' research programme funded by the ESRC, which, in late 2007, produced six booklets on various aspects of the relationship between science and society. Many scientists now appreciate that non-scientists ought to contribute to discussions concerning science policy. There is a growing awareness among scientists and others of the role that values play in science policy, and of the importance of subjecting medical and other scientific research to ethical assessment. That universities are becoming increasingly concerned about these issues is indicated by the creation, in recent years, of many departments of 'science, technology and society', in the UK, the USA and elsewhere, their focus being interactions between science and society.

There are two initiatives that I have been involved with personally. The first is a new international group of over 230 scholars and educationalists called Friends of Wisdom, "an association of people sympathetic to the idea that academic inquiry should help humanity acquire more wisdom by rational means".¹¹ The second is a special issue of the journal *London Review of Education*, which was devoted to the theme 'wisdom in the university', and which appeared in June 2007.¹² By coincidence, another academic journal, *Social Epistemology*, brought out a special issue on a similar theme in the same month.¹³ Later that year, 'History and Policy' was launched, a new initiative that seeks to bring together historians, politicians and the media, to work "for better public policy through an understanding of history".¹⁴

Much still needs to be done

None of these developments quite amounts to advocating or implementing wisdom-inquiry (apart

from the two I am associated with). The new environmental research organisations and the emphasis on policy studies of various kinds do not in themselves add up to wisdom-inquiry. In order to put wisdom-inquiry fully into academic practice, social inquiry and the humanities must give far greater emphasis to the task of helping humanity learn how to tackle its immense global problems in more cooperatively rational ways than at present. The imaginative and critical exploration of these problems would need to proceed at the heart of academia in such a way that it influences science policy and is in turn influenced by the results of scientific research.

Academia would also need to give much more emphasis to the task of public education by means of discussion and debate. Our only hope of tackling the global problems of climate change, poverty, war and terrorism humanely and effectively is to tackle them democratically. But democratic governments are rarely much more enlightened than their electorates, which means that electorates of democracies must have a good understanding of what our global problems are, and what needs to be done about them.

A vital task for universities, therefore, is to help educate the public. Wisdom-inquiry would promote public education to an extent far beyond anything attempted or even imagined by academics today; it would be a kind of academic inquiry devoted to helping humanity learn how to make progress towards as good a world as possible. A university system that did that might, for example, create a shadow government, which would generate policies and possible legislation, imaginatively, critically and free of the shackles from which actual governments suffer because of all sorts of pressures, honourable and dishonourable.

We are still far from such a system today, and I suspect far from even a sense of awareness that such a system is required. Nevertheless, the developments I have indicated can be regarded as signs of a growing awareness of the need for our universities to change so as to help individuals learn how to realise what is genuinely of value in life; and help humanity learn how to tackle its immense global problems in wiser, more cooperatively rational ways than we are doing at present.

What is needed is a broader campaign to capitalise on this growing awareness and to help push the case forward for such an intellectual and institutional revolution. We urgently need academics and non-

academics to wake up to what is going on and what needs to go on – and to help give direction, coherence and a rationale to this nascent revolution from knowledge to wisdom.

Nicholas Maxwell is Emeritus Reader at University College London.

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Does animal farming undermine our global social and environmental goals?

Amanda Baker argues that we need a genuine re-evaluation of agriculture if we're to solve the looming global food crisis.

One billion people around the world are malnourished, while over one third of the world's cereals are currently used as animal feed.¹ This article argues that 'stock-free' agriculture – farming that does not use animals – can help to secure the food supply for humans.

Farming of animals reduces the food supply for humans in a number of ways. Eating plant crops 'first hand' can make better use of water, land and energy than animal farming. Stock-free farming can also cause less environmental damage.

The global food crisis

UN statistics reveal that one billion people are currently undernourished, most of them in the developing world.² These people live in poverty, and so they cannot protect their own food supply.³

At least half of the energy in animal feed is used by the animals themselves in their biological processes, and so it is lost as human food. For example, British dairy cows get over half their calories from feed concentrates - made from grains and legumes (such as beans) - which could otherwise be eaten directly by humans.⁴

The global demand for cereals and legumes for animal feed is huge, and growing. It is expected to rise to 50% by 2050.¹ The UN Environment Programme (UNEP) has calculated that food energy lost by feeding grain to farmed animals could feed more than 3.5 billion people.⁵ The loss of human food as animal feed could exceed the losses caused when crop harvests are damaged by global climate change.⁶

If we stop artificially breeding animals to farm, we can free up large quantities of food for humans. This food is already needed by undernourished people, but this 'food crunch' is set to get worse because of population growth.

At the time of writing, there were nearly 7 billion humans alive.⁷ There were also over 20 billion farmed land animals.⁸ The farmed animal population is exploding faster than the human population. Current projections suggest that, by 2050, there will

be about 9 billion humans⁷ – but perhaps 40 billion farmed animals.⁹

We can choose to stop farming animals, and to grow plant crops for humans to eat directly. This will help us to solve the global food crisis.

Global climate change

Human farming of animals also causes major indirect damage to food security, through greenhouse gas emissions. The least developed countries are already being hit hardest by harmful climate change.¹⁰

Animals farmed by humans produce large quantities of the three main greenhouse gases, carbon dioxide, methane and nitrous oxide. Ruminant farming is one of the largest direct causes of methane emissions. In a 2006 report, the UN's Food and Agricultural Organization (FAO) said:

"The livestock sector is a major player, responsible for 18 percent of greenhouse gas emissions measured in CO₂ equivalent."¹¹

Contrast this with the global transport sector, which is directly responsible for only 13.5% of global human greenhouse gas emissions.¹²

It is clear, therefore, that we can significantly cut our greenhouse gas emissions and increase food security if we move to farming without animals.

Good choices on a plant-based diet can also further reduce greenhouse gas emissions, for example avoiding produce such as air-freighted green beans, or tomatoes grown in heated greenhouses.

Hence moving to a carefully chosen plant-based diet can save an average UK resident the equivalent around 0.8 tonnes of CO₂ emissions per year.¹³

Animal farming and water

Even when water is scarce, the wealthy rarely go thirsty. It is those in poverty who suffer. Water shortages can also trigger violent conflict.¹⁴

The UN predicts that "by 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be under stress conditions."¹⁵

Water shortages are expected to hit South America, sub-Saharan Africa and Asia hardest. These

countries are already more vulnerable to the effects of droughts.¹⁶

The UN has found that animal farming has a huge impact on water quality and water use. For example, 15% of human water use worldwide is for irrigating crops for animal feed.¹⁷

Hence, stock-free farming can also relieve pressure on water resources. By choosing a plant-based diet, a UK resident can cut their food fresh water usage by a factor of three¹⁸ (although care is also needed to minimise plant foods which are very water-intensive, such as coffee).¹⁹

Social justice and land

People who have good access to fertile land can secure their own food supply, but a shortage of agricultural land can cause wars, which in turn can cause famine.²⁰

About 70% of the world's agricultural land and 30% of the world's surface land area is currently used for animal farming. One third of all arable land is used to grow animal feed.²¹

Grazing often leads to land degradation. About 70% of all grazing land in dry areas is considered degraded. This is mostly because of overgrazing, compaction and erosion attributable to farmed animals.¹⁸ Farmed cattle currently cause around 80% of all deforestation in the Amazon region.²²

It takes between 0.2 and 0.9 hectares²³ per person to grow a balanced diet.²⁴ A carefully chosen plant-based diet needs markedly less land than a meat-based diet. It has been estimated that by moving to a plant-based diet, a UK resident can reduce the land used to produce their food by a factor of three.²⁵

Green manures are plants which are grown to improve the fertility of soil. This can mean that animals are not needed for manure, and chemical fertilizers are not needed either. Green manures are particularly good for improving poorer quality soils. Poorer land is usually worked by low income farmers.²⁶

So stock-free farming can help us to make the best use of land to grow food for humans.



Traditional vegetable bed, Brazil (2007). Photo courtesy of Vegfam & Concern Universal.

Animal farming and energy

Animals use at least half of their food energy for their own life processes (such as movement and metabolism).²⁷ Current animal farming methods also use a lot of fossil fuel energy. Stock-free farming can produce food energy more efficiently, and use fossil fuels more efficiently too.²⁸

Good choices on a plant-based diet can also help, as with cutting greenhouse gas emissions. In that way, a UK resident can reduce their food energy usage by a factor of three.²⁹

Other problems

The monetary cost of farming with animals and chemical fertilizers can be high and uncertain.³⁰ Stock-free farmers can avoid these higher costs, which can help their financial security.

Farming animals is also a major source of human disease. Over the past 15 years, 75% of new human diseases have come from other animals. Farmed animals often live in large numbers and in small spaces. Farmers regularly visit the animals in their care. These conditions help new human and animal diseases to develop. The H1N1 virus which caused the 'flu pandemic of 2009 has genes from human, bird and pig influenza viruses.³¹

Conclusions

The Earth's capacity to feed us is being strained to the limit by the growing human and farmed animal populations.^{13,18} There is not enough land and water to feed us all on the meat and dairy-based diets of rich nations.^{6,7,18}

Plant-based diets use far less fertile land, fresh water and energy.²⁰ Plant-based diets which are properly balanced can support health at every stage of life.³²

Animal farming is also one of the top three human contributions to global climate change,³³ which also threatens global food security.³⁴

Agriculture without animals is important for social, economic and environmental sustainability. It can play a major role in overcoming the injustices of world hunger. It can help combat the global climate crisis.¹¹ It can also help to cut human disease outbreaks.³⁰

The world urgently needs a stock-free farming revolution.

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Arms conversion for a low carbon economy

Continued from p. 1

services market employs 880,000 people (including indirect jobs).⁶ This compares with only 300,000 jobs dependent on the military industrial sector.⁷ Furthermore the future for the low carbon sector is expected to be one of expansion, unlike military industry. The government projects that over 100,000 new jobs will be created in this sector by 2015.⁸ But more ambitious proposals would yield even more jobs. For example, a recent study by Impetus Consulting using case studies of programmes in other countries concluded that an annual £5 billion investment in domestic energy efficiency would create around 55,000 jobs directly and hundreds of thousands indirectly.⁹ A 2007 study carried out at the University of Massachusetts Amherst is also very significant.¹⁰ It estimated that \$1 billion spent on defence would create nearly 8,600 jobs but the same amount would create about 12,800 jobs in construction and related energy efficiency measures, or nearly 19,800 jobs in public transport.

It is worth taking a look at one proposed military industrial project in more detail: Trident replacement. Let's start by looking at what happened last time around. In 1980, the Thatcher government estimated that the Trident programme would create 45,000 direct and indirect jobs. However, 1995 figures showed that the actual number of jobs created was actually only 26,500.¹¹ In terms of the present situation, a study by British American Security Information Council (BASIC) suggests that, although cancelling the Trident replacement programme would lead to short-term job losses, investing the money released elsewhere in the economy could lead to the creation of 60% more jobs than were lost.¹²

It should also be remembered that there has also been a general decline in military industrial employment in the UK since the end of the Cold War. According to Ministry of Defence (MoD) figures this fell from 510,000 in 1991/2 to 260,000 in 2003/4, while the Trident-associated private companies have all carried out substantial rationalisations to cut costs so that overall employment in this sub-sector fell by nearly 60% between 1990 and 2006.¹³

Arms conversion

A number of schemes for conversion from military/defence work have been proposed over the last few decades.¹⁴ Perhaps the most famous example was in 1970s when the Lucas Aerospace Company was about to make substantial redundancies. A trade union committee put together a six-volume plan for alternatives to the existing

military projects, which included development of solar cells and hydrogen fuel cells. Unfortunately the management did not feel that these projects were in line with company strategy and they were rejected.

A similar story concerns an attempt to help the shipyards in Barrow, Cumbria, reduce their dependency on military work in the late 1980s. Trade unions collaborated with Bradford University's Department of Peace Studies to identify new opportunities to use the skills base. A range of possible technologies were identified including renewable energy systems based on wave, offshore wind and tidal power. These suggestions were also rejected.

These experiences illustrate the problems that arms conversion projects face in terms of the mismatch between proposals for alternatives and the option simply to continue with specialist arms production following company practices, which have often developed from long collaboration with the MoD. The shift from the familiar methods of military-industrial production to civil work is often considered too risky, especially in times when the national economic situation is strained.

However, successful large-scale conversion of industry has occurred on a number of occasions – for example, during demobilisation following World War II, after the closure of (US) military bases and, most recently, at the end of the Cold War as discussed above. Thus arms conversion, especially at the macro-economic level, can be very fruitful.

Conclusion

In November 2006, SGR made a submission¹⁵ to the Defence Select Committee. It included three factors that contribute to the shrinking skills base in UK science and technology:

- the extent to which the military use of science and technology resources competes with urgent civilian uses;
- the low level of employment generated per unit of investment in military programmes compared with civilian programmes;
- the extent to which military involvement with science and technology can adversely affect the public image of science and technology and so undermine recruitment and retention.

Unfortunately these continue to be highly significant factors and may even turn out to be decisive in the struggle to tackle climate change. An extensive in-depth study of the possibilities and economic advantages of arms conversion projects across a range

of industries is urgently needed. We need to encourage and develop appropriate technologies for current challenges. We have the skills and the resources to do this, but the question is do we have the will?

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Democratizing technology: risk, responsibility & the regulation of chemicals

Anne Chapman – Review by Richard Jennings

Earthscan, 2007, 80 pp., £60 (hardback), ISBN 978-1844074211

In 1996 I was blown away by Richard Sclove's *Democracy and Technology* (Guilford Press, 1995). Until then I had thought of technology as an autonomous developing process over which we had no control. Now, more than a decade later, I have had a similar experience when reading Anne Chapman's *Democratizing Technology*. Using the regulation of chemicals as a core example, Chapman develops a general philosophy of technology which has practical implications for the public assessment and regulation of new technologies.

Her discussion has two parts: an analysis of how technology innovation decisions are currently made, and a vision of how technology innovation decisions could be made in the future. The analysis of how such decisions are currently made draws on various government statements and funding policy decisions, showing clearly that the driving force behind current technology development is economic – wealth creation and profit. She has a vision of a decision process that takes into account the basic needs of humans – their biological needs, their morality, and their aesthetic sense.

After an introductory first chapter, the second chapter provides a thoroughgoing analysis of what technology is – from the historical development of the concept of technology, through a spectrum of philosophical accounts of what technology is, to a down-to-earth two-part definition of technology:

1. Technology is how we add things to the world; and
2. Technology is the things that we have added to the world that we use.

This definition introduces chapter 3, which provides a crucial linchpin the argument. Here Chapman makes the case that technological innovation is a matter of world building – just as the houses, streets and cities that we occupy are part of our world, so too are the various other products of technology – the cars, the trains and bicycles. Decisions about what technology to adopt are decisions about what kind of world we live in. And since our existence and quality of life depend on the world we live in, these decisions affect our quality of life and very existence. Chapman argues that three aspects of human existence are

relevant to decisions about technology – that we are biological organisms; that we are moral beings; and that we have an aesthetic sense – and decisions about the world that we create must take these into account. She concludes the chapter with seven principles to indicate “what should be considered in deciding whether a technology helps to make the world a fit home for human life on earth”.

In Chapter 4 Chapman analyses current government thinking about technology development and shows it is primarily concerned with economic goals – wealth creation and global economic competitiveness. She argues that governments should take responsibility not just for the economy but for how the world is built – that government should be the guardian of the common heritage of humanity and ensure that technology innovations help to build a fit home for human life on earth.

Chapter 5 is a rather technical discussion of the regulation of chemicals, which provides a contrast between the risk-based US approach to chemical regulation, where only chemicals with known harmful effects are restricted, and the EU precautionary approach, which also takes into account our ignorance of harmful effects.

Chapters 6 and 7 develop this important and central distinction between risk and riskiness – between known harmful effects and ignorance of harmful effects. Regulation based only on risk means that any new, unstudied technology can proceed without regulation in spite of our ignorance of its effects because there are no *known* harmful consequences. When we take into account our ignorance though; when we consider the riskiness of a new chemical (or other technology), we are playing a much safer game and are less likely to suffer nasty surprises. Chapman makes a strong case for regulating technology on the basis of riskiness, rather than mere risk. In the case of chemicals this means that we would be much more cautious in the use of new chemicals, and more willing to work with familiar of chemicals whose effects we understand.

Chapter 8 picks up again the argument from Chapter 3 that new technology should be judged in terms of whether or not it makes the world a better home for human life. In this important and well-argued chapter

Chapman establishes that decisions about new technologies cannot be made on the utilitarian basis of aggregating immediate individual interests, but must be made in the interests of the world, ‘the diverse individuals who together form a political unit that lasts for much longer than the individual human life span’. Chapter 9 lays the grounds for chapter 10, arguing that current government technology policy is irresponsible in its focus on economic return at the expense of the interests of the world, and making clear the difficulties in holding to account those responsible for technology with harmful effects.

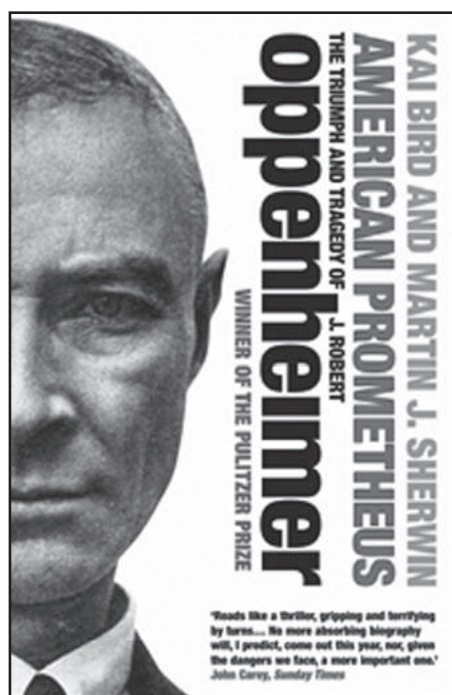
In the last chapter, chapter 10, Chapman presents her vision of how decisions about technology innovation could be changed so that they would contribute to the vision of the world as a fit home for human life on earth. She uses as her model the UK controls over built development – the planning system concerned with the development and use of land in the public interest. Using the idea that technology innovation is world building just as much as new houses and developments are world building, she argues that the kind of considerations that apply to neighbourhood development should also apply to technology development. Decisions about which technologies to develop should not be based solely on economic returns any more than decisions about neighbourhood development should be based solely on economic returns. Instead, technology developments should be assessed in terms of how they contribute to humanity's existence and quality of life: our biological, our moral, and our aesthetic needs.

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American Prometheus: the triumph and tragedy of J Robert Oppenheimer

Kai Bird and Martin Sherwin – Review by Barbara Ann Barrett

Atlantic Books, 2009, xiii + 721 pp, £9.99, ISBN 978-1843547051



This book magnificently combines careful scholarship and narrative ability to provide for Robert Oppenheimer the “full and critical biography” which Peter Nicholls so movingly invoked in his review¹ of the Pugwash volume on Joseph Rotblat.

Sherwin started interviewing in 1979 – the year that the FBI documents used in the 1954 Atomic Energy Commission (AEC) hearing were released. He “eventually came to understand that... [Oppenheimer’s] personal story, with all its public aspects and ramifications, was more complicated and shed vastly more light on the America of his day,” than either Sherwin or his commissioning editor had anticipated. In 2000 he was joined by Bird, and together they achieved their goal of successfully embedding a perceptive portrayal of Oppenheimer, based on myriad factual details and vivid individual recollections, within the enormously significant national and international context. The notes, bibliography and index fill the last 120 pages; the additional inserted illustrations include a relevant and wide-ranging collection of 92 well-annotated pictures involving family, friends, colleagues, places and events.

This vast compilation is superbly structured into forty chapters, each titled and captioned by a pair of apposite quotations from within the text, and

arranged into five main sections. The fourth and longest begins in August 1945 and finishes in December 1953. It recalls his successful leadership as director and professor of physics at the Institute of Advanced Study in Princeton, which started in 1947 (and continued until June 1966). But the main focus movingly reveals how, from within the establishment, Oppenheimer attempted to be “a staunch advocate of the international control of atomic energy and an opponent of plans to develop the hydrogen bomb” – and how abysmally these hopes were foiled; on 3 December 1953 President Eisenhower “sent a formal note to the attorney general, ordering him to ‘place a blank wall’ between Oppenheimer and classified material”.

The other parts are of roughly equal length. The first spans the years 1904 to 1935, from Oppenheimer’s birth in New York City through his youth at the Ethical Culture School and his first degree at Harvard; then, conveying the intense excitement of the development of quantum mechanics, his graduate and postdoctoral work at Cambridge, Göttingen, Harvard, Caltech, Leiden² and Zurich, and his establishment of Berkeley as another Mecca for study and research in theoretical physics. The second part relates the extent of his involvement with campaigns for social justice and civil liberties, which began in 1936; by March 1941 FBI wire-tapping had led to his designation as someone “to be considered for custodial detention pending investigation in the event of a national emergency”. It then shows how the personalities involved were such that, in spite of this listing, it was Oppenheimer who was appointed as scientific leader of the programme to use nuclear fission to build a new type of bomb. Part 3 presents his life and work at Los Alamos, from Oppenheimer’s choice of this isolated site in late 1942 until the successful test in the desert on 16 July 1945. It describes how every argument against using the bombs in Japan was overruled.

Part 5 documents the selection and sessions of the AEC security hearing board in 1954, including how the US Atomic Energy Commissioners voted overwhelmingly to accept the recommendation that Oppenheimer was unfit to be trusted with nuclear secrets. This provides a grim case study of how easily one individual’s civil liberty can be infringed. The last three chapters cover him “carving a new role for

himself ... becoming a distant but charismatic intellectual outsider”. In 1963 the government awarded him the Enrico Fermi Prize for public service. Oppenheimer was diagnosed with throat cancer in February 1966 and died a year later.

The authors appropriately avoid any judgemental conclusions; I can only praise the richness of the moral and psychological insights that are threaded throughout the book. The prologue beautifully describes the memorial service held at Princeton a week after Oppenheimer’s death; the epilogue poignantly outlines a few further aspects of the lives of his wife, son, daughter and brother. “Robert would have been proud of Frank. Everything the two brothers had learned in two lives devoted to science, art and politics was brought together in the Exploratorium”.³ Leaving the reader to appreciate the authors’ own ending, I have chosen to conclude with this extract that resonates so fully with the aims of SGR:

“The whole point of the Exploratorium,” Frank said, “is to make it possible for people to believe they can understand the world around them. [...] If we give up trying to understand things, I think we’ll all be sunk.” He worked in the hope that “human understanding will cease to be an instrument of power . . . for the benefit of a few, and will instead become a source of empowerment and pleasure to all.”⁴

Surely Oppie, on whose shoulders had rested “the dilemmas evoked by the recent conquest by human beings of a power over nature out of all proportion to their moral strength”,⁵ would have agreed.

Dr Barbara Ann Barrett holds a DPhil in particle physics.

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A regime on the edge? How replacing Trident undermines the nuclear non-proliferation treaty

Nick Ritchie – Review by Jim McCluskey

Bradford Disarmament Research Centre, November 2008, 20pp. Available to download at: <http://www.brad.ac.uk/acad/bdrc/nuclear/trident/trident.html>

The Nuclear Non-Proliferation Treaty (NPT) commits those states equipped with nuclear weapons to divest themselves of their nuclear arsenals and those states without nuclear weapons to abstain from acquiring them. The UK government signed the NPT in 1968.

In 2007, parliament voted in support of the UK government's intention to renew the Trident nuclear missile system. This decision means that Britain will have a nuclear capability well into the 2050s. Most reasonable people would conclude that the UK is not complying with the treaty. It also seems reasonable to conclude that as long as the UK (together with other nuclear states that have signed the treaty) does not honour its commitment, this will have a detrimental effect on the commitment by the non-nuclear states that have signed the treaty not to acquire these weapons.

However the British government does not accept these conclusions, so a detailed analysis of the situation that exposes the contradictions in the government's

position is required. We are indebted to Nick Ritchie for the capable and thorough contribution to this task that he has made by way of this paper.

The paper outlines the two crucial norms embodied in the treaty: against nuclear proliferation on the one hand and towards nuclear disarmament on the other. It emphasises the vital importance of the NPT in ensuring the security of us all and explores how its authority is based on perceived legitimacy, a legitimacy that is undermined by a lack of even-handedness between existing nuclear and non-nuclear states. Rolling back nuclear programmes in non-nuclear states is dependent on removing this discrimination and working towards disarmament in the nuclear states.

In his summary Ritchie writes: "The actions and policies of the nuclear weapon states will *either* reinforce these norms *or* undermine them," adding: "Britain's decision to renew Trident can only reinforce

the value of nuclear weapons and the logic of nuclear deterrence...and weaken the treaty".

The paper effectively exposes the contradictions in the government's position and makes a number of recommendations, including that the government commissions "...a detailed study of steps Britain could take to further de-value and reduce its own nuclear force on a verifiable path".

The pertinence of its message was underlined by Mohamed El Baradei, Director General of the International Atomic Energy Agency, when he warned earlier this year that we face the emergence of 20 new nuclear states within a few years.¹

Jim McCluskey has a background in civil engineering, writing and peace activism.

Reference

1. The Guardian (2009). Mohamed ElBaradei warns of new nuclear age. 15 May.

The power of sustainable thinking

Bob Doppelt – Review by Martin Sahlén

Earthscan, 2008, 218 pp, £16.99 (hardback), ISBN 978-1844075959

Given its subtitle of "How to create a positive future for the climate, the planet, your organisation and your life", you could be forgiven for having high expectations of this book. You might also consider it unlikely to live up to them. However, it largely does, successfully delivering a practical and inspiring vision for change that is applicable in many life situations.

Doppelt, director of Resource Innovations and The Climate Leadership Initiative at the University of Oregon's Institute for a Sustainable Environment, introduces the book by mapping out the underlying thought patterns that have given rise to what he calls the "take-make-waste" paradigm. He does so with straightforward examples and illustrations of how common "thinking blunders" prevent us from genuinely sustainable behaviour.

Examples of these blunders include quick fixes; responding to symptoms instead of root causes; a "technology can save us" attitude; "less bad is good enough"; and "all for one and none for all" among

others. After the introduction, Doppelt goes on to suggest successful strategies for change towards sustainable thinking and behaviour. The discussion and proposed pathways to change are all based on contemporary research findings in a range of disciplines and are well-referenced. Interspersed among the more theoretical descriptions are practical, real-life examples of people and organisations that have changed from non-sustainable to sustainable thinking and practices.

The primary purpose of this book is not to convince the reader of the state of things, but rather to provide a straightforward description of the thought and behavioural patterns that underlie unsustainability, and of methods for successfully changing those to patterns that support sustainability. He maps out the change process, which evolves from disinterest, through design and action, to defending new values and behaviour. Particular emphasis is placed on how the methods for change can be adapted to the stage of change at which the people and organisations involved find themselves.

In passing, Doppelt notes that a common failure among environmentalists is not to recognise this basic psychological fact: that people are quickly alienated by the irrelevance of proposed measures to their own position. Doppelt goes on to describe how to motivate people and organisations to change. One of the core tenets of his reasoning is: "you have to change yourself to motivate others and your organisation to change." The emphasis is clearly on effective methods: what will deliver the end results?

In summarising his approach, he argues that all future thinking must be systems-based, and new sustainable ethics must be adopted. This change must start at the personal level and spread from there. Ultimate success will depend on your and our orientation to the challenge – individually and collectively.

This book is recommended for most people thinking about living more sustainably and offers useful advice for everyone from business executives to green campaigners to the average citizen, all of whom are sure to find valuable insights.

Dr Martin Sahlén is a post-doctoral research fellow in cosmology at the Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden.

The ethics of technological risk

Lotte Asveld and Sabine Roeser (editors) - Review by Richard Jennings

Earthscan 2009, 290 + xiv pp, £65 (hardback), ISBN 978-1844076383



This is one of many works on risk published by Earthscan. The papers in this volume are the product of a conference on ethical aspects of risk held in 2006 at Delft University in the Netherlands.

There are 17 papers, divided into six parts. Part I provides the Introduction (comprising 2 papers) and Part VI, the Conclusion (one paper). Part II is concerned with formulating the Principles and Guidelines that should be adhered to when managing technological risk and this is presented by five papers. Part III – comprising three papers – is concerned with Methodological Considerations, and particularly with how ethical considerations can be incorporated into risk assessment. Part IV (four papers) addresses the problem of Involving the Public in risk management, and, in particular, how to work with emotional responses to risk. Part V considers Instruments for Democratization (in two papers): the possible ways in which the public can be given a voice in risk management.

This book makes a significant contribution to the development of a new vision for science and society, a vision that sees society actively engaged in making decisions about the content and direction of technological development.

One of the first issues raised by the book is the standard, one-dimensional conception of risk that is currently considered normal. This is raised by Sven Ove Hansson's introductory paper and developed further by Carl Cranor's paper calling for a rich

conception of risks. This theme recurs throughout many of the other papers too, and reveals the need for ethical engagement with the analysis of risk. Henk Zandvoort provides an ethical (if idealistic) foundation for assessing the social acceptability of risk-generating technological activities, and Duff Waring follows with a precise analysis and disambiguation of the concept of clinical equipoise. Marc D. Davidson makes a strong case for weighting equally the risks to future generations and the risks to present generations, and Arianne Ferrari makes an equally strong case against the genetic modification of animals for xenotransplantation or for producing therapeutic proteins.

In considering methodological issues Douglas MacLean argues that the concept of well-being cannot be reduced to 'willingness to pay', and Nicolas Espinoza argues that some risks may not even be qualitatively comparable – which would render the whole enterprise of comparing risks impossible! Greg Bognar provides a nice argument to the effect that we cannot establish any coherent principle governing reasonable levels of risk-taking.

To my mind Parts IV and V, dealing with the involvement of the public in assessing technological risk, were the most interesting. Part IV begins with two papers addressing the theory that our judgements are divided into those that are intuitive, non-verbal, experiential and generally subjective; and those that are analytical, verbal, logical and generally objective. The paper by Paul Slovic, Melissa Finucane, Ellen Peters and Donald G. MacGregor accepts this distinction, arguing that the layperson tends to judge risk in the former way and goes on to consider how this can contribute to objective risk analysis. The following paper by Sabine Roeser questions the distinction, arguing that the layperson is not lacking in objectivity but rather takes more of the moral factors into account in assessing risk. Mark Coeckelbergh also defends the layperson's judgement and proposes a way to avoid the polarisation between the analytical expert and the intuitive public through the use of imagination. The final paper in Part IV by Lotte Asveld considers the case of mobile phone technology and the Netherlands debate over the risks of this new technology. This was a very insightful analysis of the sources of disagreement and of how consensus could possibly be achieved.

In Part V Gero Kellermann considers the role of National Ethics Councils (NECs), which include lay members. He argues that through the process of deliberation NECs achieve a level of ethical expertise that goes beyond that of any member of the NEC. The following paper, by Anke van Gorp and Armin Grunwald, considers the regulative frameworks that govern engineering works and argues that regulative rules cannot cover all the particulars of new design, even of standard design, so engineers must be prudent when relying on them. Moreover they must feed back new insights that arise from new designs into the formulation of regulations. By way of a conclusion, Michael Baram discusses the move away from the centralised, governmental 'command and control' approach to regulation and towards industrial self-regulation in the USA, and the problems this raises.

On the whole I found this book very informative and insightful. It places the issue of technological risk clearly in the domain of ethics and establishes that risk assessment is neither a neutral nor a value-free activity.

Dr Richard Jennings lectures on ethical issues in science in the University of Cambridge.

What's your 'book of the decade'?

As we enter a new decade, we at SGR thought it would be good to look back over the last one and ask: which books related to ethical science, design and technology would you rate as the best and why? Which have helped most to change thinking on key global issues?

If you would like to write a review of your favourite book, please contact us at <newsletter@sgr.org.uk>

The secret life of the universe: the quest for the soul of science

Amy Corzine – Review by Dimitris Sarantaridis

Watkins Publishing, 2008, 276 pp., £10.99, ISBN 978-1905857654

From the title alone, one can hardly imagine what to expect of this book other than at best an interesting popular science read. It turns out that *The Secret Life of the Universe* is an ambitious attempt to provide a holistic view of mainstream perceptions and New Age Weltanschauung; meaning that science and pseudoscience, normal and paranormal, seen and unseen all belong to the same realm – the universe that we live in. There is a great breadth of information in the book to (not) convince the reader of the validity of the above, but three ‘themes’ come up regularly: Hindu/Buddhist philosophy and practices (mainly meditation), a particular eco-village community in Scotland and...Uri Geller!

Corzine blends Eastern and Western thinking from the very start. She introduces us to “man’s connection to the universe” through Hinduism/Buddhism along with a history of science. Several significant moments are listed (with a few inaccuracies here and there, but nevertheless in an interesting way), from Galileo and Newton to Einstein and quantum and string theories. And it is quantum theory, with its “duality” and “entanglement” that leads the author to claims of scientific explanations of phenomena such as telepathy; phenomena which of course science cannot exclude, but cannot accept either unless mechanisms (or maths) are developed to describe and predict them.

We learn also in this chapter about mind and matter interactions and the controversial “Global Consciousness Project” (which we find later can allegedly even predict big global events through “Random Event Generation” experiments), followed by discussions on moral dilemmas related to ecology, GM food and eco-villages.

Here is where we are first introduced to the Findhorn community, which, among other very interesting things, has been working with fairies, devas and angels! Finally, at the close of the first chapter we get a bit more Buddhist philosophy and a few more stories on telepathy. If the above seems somewhat confusing and ‘cramped’, it is because it is, and this is how most of the book is laid out.

Nevertheless, the author makes a few interesting points, which I have managed to note. On issues of the environment and ecology she stresses that too

much of a good thing can be a bad thing, such as the exploitation of the organic food industry or biofuels, which can have adverse effects on the environment and general wellbeing. In addition, existing and emerging renewable energy technologies are presented against conventional solutions, such as nuclear energy, and the route of using less energy as a means of reducing our emissions is also highlighted. There are also interesting views on health issues; for example, there is far too much long-established experience of traditional medicine to just ignore, and the solution to some of our health problems may lie simply in a suitable diet and exercise, instead of drugs and surgery.

However, these interesting points hardly break the surface of the book’s sea of absurdities, misconceptions, and statements that are plainly wrong.

For example, homeopathy and acupuncture are presented as closed cases, scientifically proven, which is far from true. At another point “thought experiments” and “group meditation” are referred as if they belong to the same category of activities. The notion that primitive cultures were always in harmony with their surroundings is promoted, ignoring cases of societies that vanished exactly because they failed to maintain this harmony (see *Collapse* by Jared Diamond, Penguin, 2006). And, moreover, we read that “...Buddhism is possibly the world’s most scientific religion...” which is as problematic a statement as can probably be.

The rest of the book goes like this: description of several grassroots organisations, Findhorn, meditation, remote viewing, Uri Geller, meditation, Uri Geller, Findhorn, Yoga, meditation, epigenetics, light pollution, the opinion that TV is bad for the kids, music as healer, animals as healers, sound healing, psychics, contemplative neuroscience, Uri Geller, glocalisation, captured creatures moving inside stones, Findhorn, biomimicry, sacred sites, Findhorn, eco-cities/villages/schools, the superconductive Ormus residue, Findhorn, water pollution, Findhorn, water “memory”, water that can change the taste of lemon...acting from a distance (!), crystal technology, Uri Geller, Higgs field, near death experiences, and so on.

To conclude, Corzine has read and experienced a lot, but this venture is not successful, first and foremost

because she does not have a story to tell. At best the book serves as a reference resource on the latest New Age developments and ideas. The sceptic will find a challenge in every page, but will soon lose interest; the open minded, with a bit of personal research, will probably become a sceptic; the follower of all things weird, mystical and ‘magic,’ however, will probably be thrilled.

Our modern world faces a deep crisis on various levels, and it is not surprising that we are observing many turning to organised religion or alternative (re-born) philosophies such as the New Age movement. To face the present crisis we surely need to reconsider our values, institutions and lifestyles. And today’s pseudoscience may well be tomorrow’s dogma; but to abandon reason in the meantime I am afraid cannot be an option.

Dr Dimitris Sarantaridis is a research associate at the Department of Chemistry, University College London.

Challenging the market in education

University and College Union conference
29 November 2008, York St John University

This conference focused on the gamut of issues around the increasing marketisation and privatisation occurring in post-16 education.

One of the main speakers was Bill Greenshields, the president of the National Union of Teachers. He outlined the experience of the school sector with its academies, which are heavily influenced by business and are operated away from democratic control. He spoke about a particular instance of the involvement of a pie-and-sausage manufacturer in an institution with which he was familiar. Another speaker was Steve Sangwine, an electronic engineer from Essex University. He had been involved in the successful University and College Union campaign against INTO, which attempted to run privatised English language teaching.

There are many worries throughout the post-16 sector. For example, the practice of competitive bidding to win contracts for training is likely to lead to cost-cutting with unfortunate consequences. A case in point is 'cut-to-the-bone' training for gas fitters.

An issue for Scientists for Global Responsibility is the effect of marketisation on the nature of research carried out in universities. The emphasis on markets and competition encourages the research that is the most lucrative, rather than that which delivers the most public good. Also, there are issues around pleasing the paymaster, with the potential to give results that the paymaster wants to hear, rather than those which are scientifically most correct. Good science involves the recognition of uncertainty and the potential risk of systematic error. A system based firmly in marketisation is likely to damage scientists as well as science itself.

Review by Paul Marchant, Leeds Metropolitan University

Radical Statistics conference

Whose Statistics?

Saturday 27th February

Friends House
Euston Road, London

The program includes:

- David Miller on Spinwatch
- Eileen Magnello on Florence Nightingale
- Paul Marchant on street lighting
- Heather Brooke on 'right to know'
- Harvey Goldstein on statistical ethics
- Danny Dorling on statistics of injustice
- Plus workshops and social activities

Radical Statistics ('RadStats') is a small, not-for-profit, and almost entirely volunteer-run organisation.

It recognises the social context in which the subject of statistics operates.

For more information and booking, see:
<http://www.radstats.org.uk/conf2010/index.htm>

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Current projects include:

- UK Leadership for a Nuclear Weapons Free World
- Devaluing Nuclear Weapons in Security Policies
- Independent Scientific Advising on Policy Making
- A UK Disarmament Laboratory
- Fissile Material Disposition
- Public Outreach and Education
- Training the Next Generation of Responsible Scientists

Visit www.pugwash.org/uk/membership

or email pugwash@mac.com

*UK Affiliate, Pugwash Conferences
on Science and World Affairs,
co-recipients 1995 Nobel Peace Prize*

Are children being taught all the skills they will need in order to adapt to the 21st century?

The three 'Rs', science, IT, are essential but, as a number of global processes impact on food production, perhaps food gardening will become more a matter of survival than mere lifestyle choice. Even if life continues much the same, food gardening has many benefits, not least stimulating interest in healthy eating. At a school, gardening can develop social and co-operative skills, and is an excellent antidote to class room, play ground and general life stress. Gardening can involve every subject but the sciences are particularly important.

In gardening, the right things have to be done at the right time, or results will be poor. Poor results will teach children that gardening is not worth doing, but get it right and there is nothing like the excitement of children digging up a good crop of potatoes or pulling their first carrots.

A garden that is designed well for function and productivity will also look attractive. I can advise on all aspects of food gardening for schools: the design, conversion of the site, management of the garden through the seasons, and what tools to use and where to get them.

I have 30 years' experience of organic gardening, including 20 years' self-sufficiency and eight working in walled gardens. I have a recent degree in soil science (2006). I have also worked at primary schools creating and managing vegetable gardens.

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Building a low carbon economy: the pathway from recession

SGR conference and AGM, 24 October 2009

The Gallery, Alan Baxter and Associates, London EC1

Stuart Parkinson, SGR's Executive Director, welcomed the 70 participants to the conference. He pointed out the timeliness of the event with the Copenhagen climate negotiations rapidly approaching. The day comprised three main speakers, eight poster presentations (see box) and SGR's AGM.

The UK Low Carbon Transition Plan: Where are we going?

Tim Foxon from Leeds University began by outlining the urgency of the climate issue and the requirements for action by the UK. He gave the government credit for being ahead of most other countries in having passed, with cross-party support, the Climate Change Act, which set a legally binding target of an 80% cut in greenhouse gas emissions by 2050 (from the 1990 level). In addition, they have published the UK Low Carbon Transition Plan, which set out targets and measures for key sectors, such as electricity.

However, Tim pointed out that a recent report by the government's climate advisors has argued that progress towards the 80% goal is already slipping and that a step-change in emissions reduction action is needed – especially in reforming the electricity market, supporting home energy efficiency, and speeding up the introduction of electric vehicles. Tim also highlighted proposals for a Green New Deal, which includes radical economic reforms to support the transition to a low carbon economy.

Tim concluded that the government's ideological devotion to short-term market forces was obstructing action on climate change. He also argued that government's proposal for an extra £180 million for expansion of the renewable energy industry was far too small.

Arms conversion for a low carbon economy

David Webb of Leeds Metropolitan University continued the theme that UK climate action needs a step-change. He quoted a statement by Gordon Brown, which said that low carbon industry could be a major employer and export generator, but pointed to the inadequacy of the policy follow-through. The proportion of UK energy from renewable sources is one of the lowest in the EU, and research and development spending has only recently started to reach levels comparable with other leading nations.



He contrasted this with Britain's performance in the military sector. The UK military budget is the fourth largest in the world, with spending having risen 21% since 1999. The UK is also home to BAE Systems, the world's second largest arms company. David also showed figures illustrating that government R&D spending in the military sector is 40 times that spent on renewable energy.

Moving on to employment, David pointed out that jobs in the military industrial sector only made up 2.3% of the total number in the manufacturing sector – much less than commonly realised. There has been a series of reports in recent years exploring the opportunities for arms conversion to assist the expansion of the low carbon economy, and he summarised some of the main findings.

Critically, the costs of many current or proposed military programmes are extremely high but generate comparatively few jobs. For example, the total cost of Trident replacement (including operation) has recently been estimated at up to £100 billion. The two aircraft super-carriers on order will cost at least £33 billion over their lifetime. But between 50% and 130% more jobs could be created by investing the same amount in sectors such as home insulation or public transport. Furthermore, most military industrial jobs are in areas of high employment (such as south east England) so a reduction in the sector would have limited impacts.

A trade union programme for the creation of one million climate-change jobs

Gareth Dale of Brunel University gave a presentation that outlined the basis of the 'Green Jobs Charter'

being drawn up by climate campaigners, trade unionists and academics.

Gareth started by arguing that the two crises we currently face – the economic crisis and climate change – can be solved together, but only if conventional economic thinking is abandoned. He criticised the lack of ambition in government policy, pointing out that new money earmarked for the renewable energy sector is much less than the bonus package payable to staff at the part-nationalised Royal Bank of Scotland. He argued that the lack of support given to workers made redundant at the Vestas wind turbine factory demonstrated the government's true lack of commitment.

The Charter proposes an annual £50 billion investment in renewable energy, home energy efficiency and public transport. This, he argued, could create over one million jobs by 2020 and meet the emissions reduction targets laid down by the government's climate advisors. For example, 300,000 jobs could be created in home energy efficiency leading to a 51% cut in emissions.

Where would this funding come from? Gareth argued that £20 billion could be found from a range of sources including: taxes on the highest earners; windfall taxes on excessive profits; or 'quantitative easing'. The other £30 billion would be generated by the employment itself, including income tax, savings in benefit payments, public transport fares, energy bills, indirect job creation etc.

Detailed figures will be published in a report due for completion in early 2010.

Discussion

Discussion covered a wide range of issues from nuclear power to nationalisation. Many questioned why government persisted in policies which were either ineffectual or would actually increase emissions. It was argued that a root cause of the problem is the over-cosy relationship between ministers, senior civil servants and big business. There was much pessimism about the potential outcome at the Copenhagen negotiations.

continued on p.32

An Economy with Personal Asset and Income Limits

Alan Cottey, University of East Anglia. a.cottey@uea.ac.uk

A Sustainable Economy

GROWTH. The economic ideas and practices which have long been in the ascendancy depend on continual growth. A low carbon economy has to differ from the current economy in fundamental ways.

RADICAL CHANGES ARE AFOOT AND WILL ACCELERATE, driven by the planet's new ecological conditions.

THE MOST DEEPLY INTERNALISED HUMAN VALUES must become those of cooperation and conservation, not those of individualism and consumption.

VALUES, NOT MONEY are fundamental to economics.

THE FUNDAMENTAL MEANING OF ECONOMICS relates to our management of our 'household', that is, of the practical matters which permit us to live in a civilised society, part of a sustained global ecology.

A SUSTAINABLE ECONOMY will be much less highly monetised than the current economy. Energy, emissions, shelter, water, food, health, education and justice will not be expressible in purely monetary terms and will not be commoditised.

IN SUCH AN ECONOMY, individuals' sense of well-being will depend less on monetary assets and income, and more on self-esteem, sociality and restfulness.

GROSS ECONOMIC AND SOCIAL INEQUALITY is currently a major obstacle to achieving a sustainable economy.

THE 'COLLECTIVE NET WORTH' OF THE WORLD'S BILLIONAIRES is \$2.4 Trillion, according to Forbes Magazine, March 2009.

UNLIMITED ASSETS OR INCOME FOR INDIVIDUALS should be socially unacceptable, in much the same way that having an unlimited number of spouses is socially unacceptable.

Personal Asset and Income Limits

THE PERSONAL ASSET AND INCOME LIMITS (PAIL) proposal is that there be limits for each person on the personal assets and income they may have.

THE LIMITS vary with time, from cradle to grave, and depend on the person's needs and responsibilities.

NOT A TAX. A fundamental feature of the scheme is that it is not a tax. Taking away a person's legitimately acquired assets at the rate of 100% would be justifiably unpopular.

EXCESS ASSETS AND INCOME ARE NOT LEGITIMATE. The scheme delegitimises assets or income above the person's limit. This is achieved by each person having two AIL accounts ...

A PERSONAL ACCOUNT AND A HOLDING ACCOUNT. Income which would at the time take a person above their limit would be paid into the holding account.

THE HOLDING ACCOUNT would be held in escrow, that is, held by a trustworthy institution charged with the duty of deciding later if such income may be paid to the individual or if it goes to a collective account.

AIL WILL NOT ENFORCE UNIFORMITY. Talented, determined or lucky people might have much more glamour, or respect, or fame, or honour, or power, or resources to do important work, than other people.

SUCH ENVIRONMENTALLY NEUTRAL BENEFITS must not, however, be tradable for other benefits that have environmental or justice costs.

MORE ABOUT PERSONAL ASSET AND INCOME LIMITS can be found at www.uea.ac.uk/~c013/ail/ail.html

Poster presentations¹

Biofuels in Power Generation
Camilla Royle

Desertec
Robert Palgrave

An Economy with Personal Asset and
Income Limits²
Alan Cottey

Financial Viability of Artificial Trees
Karl Miller

Light Pollution
Paul Marchant

Militarisation of Space
Philip Chapman

Rational Strategies for the Design of
Zero Carbon Commercial Building in
the Northwest of England
Alex Mitchell

Science and the Corporate Agenda
Chris Langley and Stuart Parkinson

1 in alphabetical order by topic
2 This poster is reproduced on p.31

Continued from p.30

Annual General Meeting

Philip Webber, Chair of SGR, opened the AGM. Stuart Parkinson summarised SGR's activities as documented in the 2008-9 annual report. There had been a number of successes – for example, publication of the briefing, *Behind Closed Doors*, which critically examined the military influence on UK universities, numerous public lectures, and a range of advocacy work. Treasurer, Patrick Nicholson summarised the accounts, pointing out that SGR's finances remained tight. The annual report and accounts were approved by the meeting.

This was followed by the election of the National Co-ordinating Committee (NCC) for the coming year. Three committee members stepped down – Martin Quick, Hilary Chivall and Sean Rose – and they were thanked for their services. The remaining members stood for re-election, together with Martin Bassant. All were elected unanimously. For a full list of the current NCC, see p.3.

Stuart Parkinson then gave a brief update of SGR activities since March. In particular, he highlighted the successful launch of the in-depth report, *Science and the Corporate Agenda*, which had taken place a few weeks before the conference (see p.5). Patrick Nicholson then discussed SGR's recent finances, discussing the difficulties brought about the economic downturn.

Finally, a vote of thanks was given to Chris Langley, SGR's principal researcher, who was retiring after six years with SGR (see p.6).

Kate Macintosh, Vice-chair of SGR, closed the event.

Summary by Kate Macintosh and Stuart Parkinson

Articles based on the three main presentations can be found on p.1, p.8 and p.9.

