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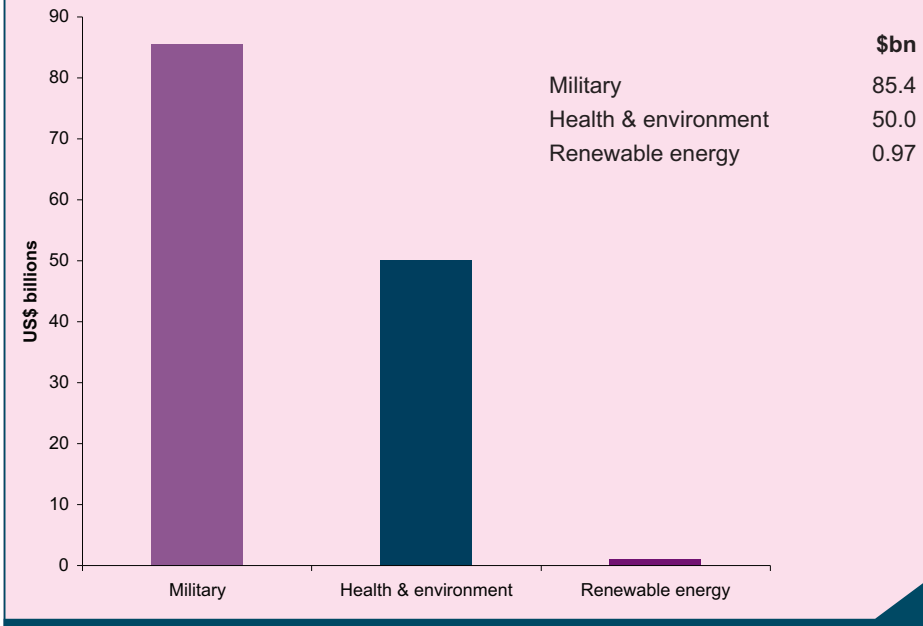

Image: SGR ©

Figure 1 - Comparison of government R&D spending in industrialised countries, 2004.
Figures are in US$ (purchasing power parity). Those for military and health/environment R&D are for OECD (most industrialised) countries. Figures for renewable energy are for IEA countries (OECD minus four minor countries). Further details are given in the text.

Military R&D 85 times larger than renewable energy R&D

Stuart Parkinson and Chris Langley outline SGR's latest research whose revelations include statistics from across the industrialised world showing the massive imbalance between government R&D spending for military purposes and that for social and environmental purposes.

In August, SGR published a new briefing, *More Soldiers in the Laboratory*[1], which updates the arguments concerning the military influence over science and technology provided in our previous report[2] from January 2005. The briefing charts the most recent developments in this field, especially in the UK and USA, and argues that flawed government thinking is continuing to drive the expansion of this military influence.

In the USA, government spending on military research and development (R&D) is expected to reach a massive $78 billion in 2007, a 57% increase since 2001[3]. In the UK – third in the world rankings in terms of government spending on military R&D – the changes have been more qualitative, with two new national programmes rolled out in the last two years: the Defence Industrial Strategy and the Defence Technology Strategy. The latter in particular marks an expanded effort to involve universities more deeply in military R&D.

The briefing argues that this increasing military involvement in R&D continues to drive a narrow weapons-based security agenda. This is despite major shortcomings in this approach being apparent – not least in current conflicts such as the Iraq war. The briefing argues that this marginalises a broader approach to security, which would give much greater priority to supporting conflict prevention by helping to address the roots of conflict. As part of this case, the briefing points out how R&D that aims to help tackle poverty, climate change and ill-health – and thus help to provide basic security for human populations – is under-funded compared with military R&D. As an example, in 2004, governments in the wealthier,

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A few words from the Director

There are real signs that the connection between environmental issues and peace issues are at last being widely appreciated. Last March, UN Secretary-General Ban-Ki Moon had warned that the impacts of climate change "are likely to become a major driver of war and conflict"[1]. But perhaps the most high-profile recognition of the connection came in December, with the joint award of the Nobel peace prize to the Intergovernmental Panel on Climate Change (IPCC) and former US vice president turned climate campaigner, Al Gore. In a very public way, the Nobel committee pointed out the major threat that climate change poses for international security, while also recognising the importance of the scientific understanding – due to the IPCC – and the need for education work – of which Al Gore has been such a high-profile proponent. Raj Pachauri, Chair of the IPCC, summarised the connection in a novel way in his acceptance speech: "peace can be defined as… the secure access to resources that are essential for living"[2]. He then outlined how unchecked climate change would lead to considerable disruption to access to such resources. Al Gore, in his acceptance speech, argued that in order to tackle climate change "we must quickly mobilize our civilization with the urgency and resolve that has previously been seen only when nations mobilized for war"[3].

Of course, SGR has continued to be very active in highlighting the importance of pursuing a joint peace-environment (and social justice) agenda, and this issue of the SGR Newsletter exemplifies this. At our annual conference in October (see p.28) speakers highlighted the connection between resource depletion and the potential for conflict. For example, Dan Smith argued that climate change could jeopardise water, food and other resources leading to instability and conflict in as many as 92 countries. In addition, Mandy Meikle outlined the potential flash points being created by the 'peak oil' problem. In August, SGR published a new briefing (see p.1) which pointed to the massive and expanding funding of military science and technology, contrasting this with the much smaller finance directed towards science and technology aimed at (for example) tackling climate change. A very stark reminder of the global environmental threat posed by even a small nuclear war is provided by Philip Webber's article on the climate effects of nuclear weapons (see p.6). Meanwhile, as Almuth Ernsting argues, even claimed solutions to environmental problems such as biofuels can cause insecurity and even conflict over land (see p.19). So, while urgent action is essential in trying to tackle these threats, we need to take care not to become part of the problem.

Stuart Parkinson

References

1. Nichols M. (2007). *Climate change as dangerous as war.* Reuters, 1 March. http://www.reuters.com/article/worldNews/idUSN0135435720070301
2. Pachauri R.K. (2007). *Acceptance speech for the Nobel peace prize awarded to the Intergovernmental Panel on Climate Change (IPCC).* Oslo, 10 December. http://nobelprize.org/nobel_prizes/peace/laureates/2007/ipcc-lecture_en.html
3. Gore A. (2007). *Acceptance speech for the Nobel peace prize.* Oslo, 10 December. http://nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html

Update on ethical careers activities

SGR's ethical careers programme has been through a quieter period in recent months as our resources have been tied up with other issues. However, our work has had some notable press coverage during the period – in particular, a number of articles following on from our booklet, *Critical Paths*[1].

In the summer, *The Guardian* ran an article on 'gap years' which featured Annie Brown, one of those profiled in *Critical Paths*, discussing ethical possibilities in this area. In December, *Science and Public Affairs* included a double-page spread[2] on ethical careers based on three of the *Critical Paths* case histories. In addition, the September issue of *Science and Public Affairs* included an article by Vanessa Spedding arguing that if there were a greater focus in scientific careers on environmentally and socially beneficial outcomes, this could help significantly in attracting young people into these fields[3]. Finally, an interview with Stuart Parkinson was published on the *Ethical Jobs* website in October.

We have also taken part in two events in recent months. Stuart Parkinson ran a workshop at the Vale Festival at Birmingham University and, with help from student volunteer Ben Samuel, he ran a stall at the Royal Society of Chemistry's 2007 *ChemCareers* event, also in Birmingham. It was notable that SGR was invited, given the presence of a number of controversial employers, including the Atomic Weapons Establishment.

Our existing ethical careers publications[4] continue to be very popular with over 2,000 copies being downloaded or picked up at events in the last six months.

Over the next few months, SGR will be running stalls at ethical careers fairs at the following venues:

- Oxford University – 26 January
- Cambridge University – 7 February
- Birmingham University – 21 February
- Leeds University – 4 March
- Sheffield University – 5 March
- Manchester University – 6 March
- Loughborough University – 23 April

If you would like to volunteer to help on a stall (or just find out more about what is involved), please see the volunteering section on p.4.

Finally, we were saddened to hear of the death of Anita Roddick, founder of The Body Shop, whose charitable foundation awarded a grant to SGR's ethical careers programme in 2004. The grant has continued to support much of our work in this area over the period since.

Stuart Parkinson and Vanessa Spedding

References

1. Parkinson S., Spedding V. (2006). *Critical Paths: 12 inspiring cases of ethical careers in science and technology.* SGR. http://www.sgr.org.uk/ethics.html
2. Heath E., Kenny L., Völlm B. (2007). *Keeping faith.* Science and Public Affairs, December, p12-13. British Association for the Advancement of Science. http://www.the-ba.net
3. Spedding V. (2007). *How many experts does it take to switch students on to science?* Science and Public Affairs, September, p27. British Association for the Advancement of Science. http://www.the-ba.net
4. Copies of all SGR's ethical careers publications can either be downloaded from http://www.sgr.org.uk/ethics.html or ordered from the SGR office (contact details on the back-page).

Security and disarmament activities

SGR's work on security and disarmament issues continues apace, with a range of research and advocacy activities.

As discussed in the front-page article, we published a new briefing in August, which provides an update on the militarisation of science and technology in the UK and elsewhere. The briefing received good coverage in the technical press (e.g. *The Engineer, Laboratory News, PC Pro, INES Newsletter*) and in the green press (e.g. *Peace Matters, Ethical Pulse website, International Peace Bureau News*), as well as a brief mention in *The Observer*. Over 200 copies of the briefing have so far been downloaded from the SGR website, with a similar number of printed copies having been distributed to key policy-makers, journalists, campaigners, researchers and others.

Meanwhile, Chris Langley continued his research using the new Freedom of Information Act to examine in-depth the influence of the military on a sample of UK universities. This work will be published as a report early in the New Year.

Chris has also been active in disseminating SGR's existing research on military science. He has had an academic article accepted by *The Economics of Peace and Security Journal*. He has also authored the Foreword of a new report published by the Campaign Against Arms Trade and the Fellowship of Reconciliation, aimed at campaigners against military involvement on UK campuses[1]. In November, Chris spoke at a seminar at the European Parliament in Brussels, organised by the Quaker Council for European Affairs. The event examined disturbing trends within security research in Europe. Finally, he has had a number of meetings with influential researchers in the field of security, including senior staff of the Royal Society's international security programme.

SGR has also carried out several other activities in the field of security and disarmament recently. During the summer, Philip Webber and Stuart Parkinson provided some material on the environmental and social dimensions of nuclear weapons for a training course for scientists at none other than the Atomic Weapons Establishment. Philip, Stuart and Martin Quick also input to the preparations of an exhibition called *The Nuclear Dilemma*, which will be touring UK venues soon. In September, Philip had a letter published in the *Bulletin of Atomic Scientists* discussing the latest disturbing research on the 'nuclear winter' issue. An in-depth article on this can be found on p.6.

In October, SGR held its annual conference on the issue of resource depletion and the potential for conflict. A review of this well-attended and stimulating event can be found on p.28.

Finally, on a positive note, two campaigns run by the Campaign Against Arms Trade – to which SGR is affiliated – have been victorious, as discussed on p.15. SGR signed public letters and publicised petitions as part of both of these campaigns.

Copies of the main SGR outputs in this area can be downloaded from http://www.sgr.org.uk/arms.html

Chris Langley and Philip Webber

Reference

1. Street T., Beale M. (2007). *Study war no more: military involvement in UK universities.* Campaign Against Arms Trade and Fellowship of Reconciliation. http://www.studywarnomore.org.uk/

Photo: Ben Samuel ©

Some of the new NCC and staff (from left to right): Alan Cottey, Harry Tsoumpas, Tim Foxon, Kate Macintosh, Philip Webber, Stuart Parkinson, Kate Maloney

The new National Co-ordinating Committee

The election for SGR's National Co-ordinating Committee (NCC) for this year was held during the Annual General Meeting on 6 October (see report on p.28). The new NCC is as follows:

Chair:	Philip Webber
Vice-chair:	Kate Macintosh
Treasurer:	Patrick Nicholson
Secretary:	[vacant]

Committee members:

Alasdair Beal, Roy Butterfield, Alan Cottey, Tim Foxon, Patricia Hughes, Martin Quick, Harry Tsoumpas

Climate change and energy activities

With climate change and energy issues continuing to receive a lot of political and public attention in recent months, SGR has played its part in pushing for a more sustainable agenda.

Policy work

The entry of Gordon Brown into Number 10 has not so far resulted in any major shifts in climate or energy policy. New legislation presented in the Queen's speech in early November contained one especially positive bill, but unfortunately other proposals were not so welcome. Brown's speech on climate change a few weeks later was also a mixed bag. On the positive side, the new climate change bill will enshrine in law the commitment to a 60% cut in carbon dioxide emissions by 2050, making the UK the first country in the world to have such a legally-binding commitment. Further, Brown's speech indicated that issues such as the extension of the target to a cut of 80% or more and the inclusion of emissions due to international aviation – two things SGR had argued for in a submission during the summer – would be considered by the advisory committee after the bill becomes law.

Unfortunately, the government's desire for new nuclear power stations and airport expansion seems undiminished. SGR submitted responses to two government consultations on these issues in July and October: the first on the new planning white paper; and the second on new nuclear power itself. On planning, we argued that the government should not water down public consultation on major infrastructure projects (such as nuclear power stations and airport expansions – see p.14). On nuclear power, we highlighted a whole range of drawbacks and argued for better support for alternatives. Unfortunately, the Queen's speech contained two bills aimed to push ahead with government proposals in these areas. As a further blow, the government confirmed in November that it was not going to stand by its target of 20% of UK electricity to be generated by renewable energy by 2020. In response, we issued a press statement criticising this and argued it was a sign of the government's continued preference for nuclear power over renewable energy. Brown's speech subsequently argued that the UK was "committed to meeting our share" of the EU's 2020 renewable energy target, saying further UK commitments would be negotiated under this umbrella.

Events and other activities

In addition to our policy work, we have continued to take part in public events on these issues. In all, we have spoken at seven climate and energy events in the last six months. Stuart Parkinson ran two workshops for environmental campaigners on climate science and climate myths – at the Camp for Climate Action (CCA) near Heathrow Airport and at the Shared Planet conference at Sheffield University. Alan Cottey also ran a workshop on the CCA, this one on the environmental impact of bathing (see p.13 for an article on this issue). Alan also spoke on climate change issues at the 'Confront Crisis' symposium in London. Stuart has also given three presentations on the drawbacks of nuclear power – as part of a debate with the nuclear industry at Manchester University, and at two public meetings in Cumbria.

SGR has also been involved in a number of other climate-related activities. We gave advice to organisers of a conference on climate change and migration, and also to climate campaigners in Lancaster regarding material for their website. We also took part in an online debate on climate change and the media. SGR's Climate Train project (which took place during 1997-98) was featured in a BBC World Service radio programme on the tenth anniversary of the Kyoto Protocol. Finally, some SGR members also took part in the national demonstration organised by the Campaign against Climate Change on 8 December in London.

Copies of the main SGR outputs in this area can be downloaded from http://www.sgr.org.uk/Climate.htm

Stuart Parkinson and Martin Quick

Volunteering for SGR

As members will be aware, SGR depends on volunteers in order to carry out many of its activities. At the moment we are especially looking for help with any of the following:

- Updating the SGR website (some experience of web software required)
- Mailings (would need to live within reasonable travelling distance of SGR's office in Folkestone, Kent)
- Running SGR stalls at careers fairs (see p.2 for a list of upcoming dates and venues)

If you would like to volunteer to help with any of these activities (or just find out more about what is involved), please contact the SGR office via email <info@sgr.org.uk> or phone 01303 851965.

Kate Maloney

Give your mouse a heart!

Raise money for SGR whenever you search the web.

Everyclick is a great new search engine which generates money for charity. If you nominate the Martin Ryle Trust (of which SGR is one of the main beneficiaries) then every search you make could help us. Just go to http://www.everyclick.com.

You can use *Everyclick* alongside your other search engines and it doesn't cost you a penny! If 100 SGR members use *Everyclick* and make the Martin Ryle Trust their chosen charity, this could potentially raise as much as £450 a year for SGR.

So go ahead and add *Everyclick* to your favourites or make it your home page TODAY and start making every click count for SGR.

Thank you!

Jane Wilson

Martin Rees awarded the Order of Merit

SGR sponsor and President of the Royal Society, Lord (Martin) Rees of Ludlow has been awarded the Order of Merit by the Queen. The Order of Merit, founded in 1902, is a special mark of honour conferred on individuals of exceptional distinction in the arts, learning, sciences and other areas. The Order is restricted to 24 members at any one time, and other/previous recipients include Florence Nightingale, Nelson Mandela and Thomas Hardy.

In addition to his peerage and current Royal Society post, Lord Rees is Professor of Cosmology and Astrophysics and Master of Trinity College at the University of Cambridge. He is also Visiting Professor at Imperial College London and at Leicester University.

In a distinguished career, he has been the recipient of numerous other awards and honours including the Gold Medal of the Royal Astronomical Society, the Heineman Prize for Astrophysics, a knighthood, and the Einstein Award of the World Cultural Council. He has also held the posts of Astronomer Royal and President of the British Association for the Advancement of Science, and has served on many bodies connected with education, space research, arms control and international collaboration in science.

He has been a sponsor since SGR's formation in 1992, and before that was a sponsor of one of our predecessor organisations, Scientists Against Nuclear Arms.

Stuart Parkinson

Edward Cullinan wins the Royal Gold Medal for architecture

SGR sponsor, Edward (Ted) Cullinan has won of one of architecture's most prestigious prizes, the Royal Gold Medal. Awarded annually by the Royal Institute of British Architects (RIBA), it is given in recognition of a lifetime's work in architecture that has had a truly international influence.

The honour recognises Cullinan's work, which includes over 110 buildings, his keen awareness of the natural environment, and his deep engagement with those who use and experience buildings. His International Headquarters for the RMC Group in Surrey is perhaps the clearest example of these qualities, through its innovative low energy naturally ventilated offices, pioneering workplace design and exemplary response to the existing buildings and landscape.

Since founding Edward Cullinan Architects in 1965, Cullinan has worked to ensure a holistic approach to building production: sustainability and consultation were central to the practice's building techniques long before they became widely accepted. The practice has been responsible for many highly-respected projects including the award-winning Weald and Downland Gridshell. The practice is currently working on the re-development of their office in Islington, which will exceed the Mayor of London's new target of 20% of energy from renewable sources.

Ted Cullinan is currently a Visiting Professor at the University of Nottingham, and has been awarded four other professorships including at MIT and Edinburgh University. He has also won a succession of other awards including a CBE for services to architecture in 1987.

Ted was a founder sponsor of Architects for Peace and has remained a loyal supporter throughout the subsequent mergers which, in 2005, led to his becoming a sponsor of SGR.

Stuart Parkinson

Anne McLaren 1927-2007

Former SGR sponsor, Dame Anne McLaren was tragically killed in a car accident on 7 July.

Anne McLaren was a distinguished scientist working in reproductive biology, developmental biology and genetics. She became a Fellow of the Royal Society in 1975, won a Royal Medal in 1990 in recognition of research that provided much of the scientific basis for in-vitro fertilisation and embryo transfer. She was Foreign Secretary of the Royal Society from 1991 to 1996, the first female officer of the Royal Society. She was made a DBE in 1993, and was President of the British Association for the Advancement of Science from 1993 to 1994. Together with Andrzej Tarkowski, she was awarded the Japan Prize in 2002 for their contributions to developmental biology.

Anne McLaren was also an advocate for women in science. She had three children and understood the difficulties of combining family life and a scientific career. Together with Joan Mason (Obituary, SGR Newsletter No. 29), she was a driving force in setting up Association for Women in Science and Engineering (AWiSE). She served as its President for many years and remained a stalwart supporter until her death. She will be sadly missed.

Stuart Parkinson

In brief

SGR has also undertaken a number of other activities over the last few months, most notably:

- Eva Novotny gave two lectures discussing the controversies of GM crops to sixth-form students at the Royal Latin School in Buckingham;
- Philip Webber gave a lecture on ethics in science at the Praxis Centre at Leeds Metropolitan University in July;
- Kate Macintosh had an article on architecture and social justice published in *Peace News* in November[1].

Reference

1. Macintosh K. (2007). *Cities*. Peace News, no. 2491 (November).
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Could one Trident submarine cause 'nuclear winter'?

Philip Webber analyses the latest research on the potential climatic impacts of nuclear war and demonstrates that the firepower of just one of the UK's Trident submarines could be devastating for the whole planet.

In a recent letter[1] to the Bulletin of the Atomic Scientists, I raised the possibility – based on some detailed US climate research published in early 2007 – that the nuclear weapons complement of one UK Trident submarine could possibly trigger a 'nuclear winter'. This article expands that analysis, incorporating further research carried out over the last year on the climatic effects of nuclear war.

A brief history of the nuclear winter concept

First, a bit of nuclear history. Back in the mid-1980s, one of the highest points of Cold War tensions, the world's nuclear arsenal stood at over 50,000 weapons[2] and it was very clear that if conflict between the superpowers did take place, any resulting nuclear war would be catastrophic. That view is now generally accepted, although for a good while the Thatcher government did try to reassure us that we would have a much better chance of surviving a nuclear war if we could shelter under makeshift shelters constructed of tables and mind-boggling quantities of materials supposedly available in the home or garden!

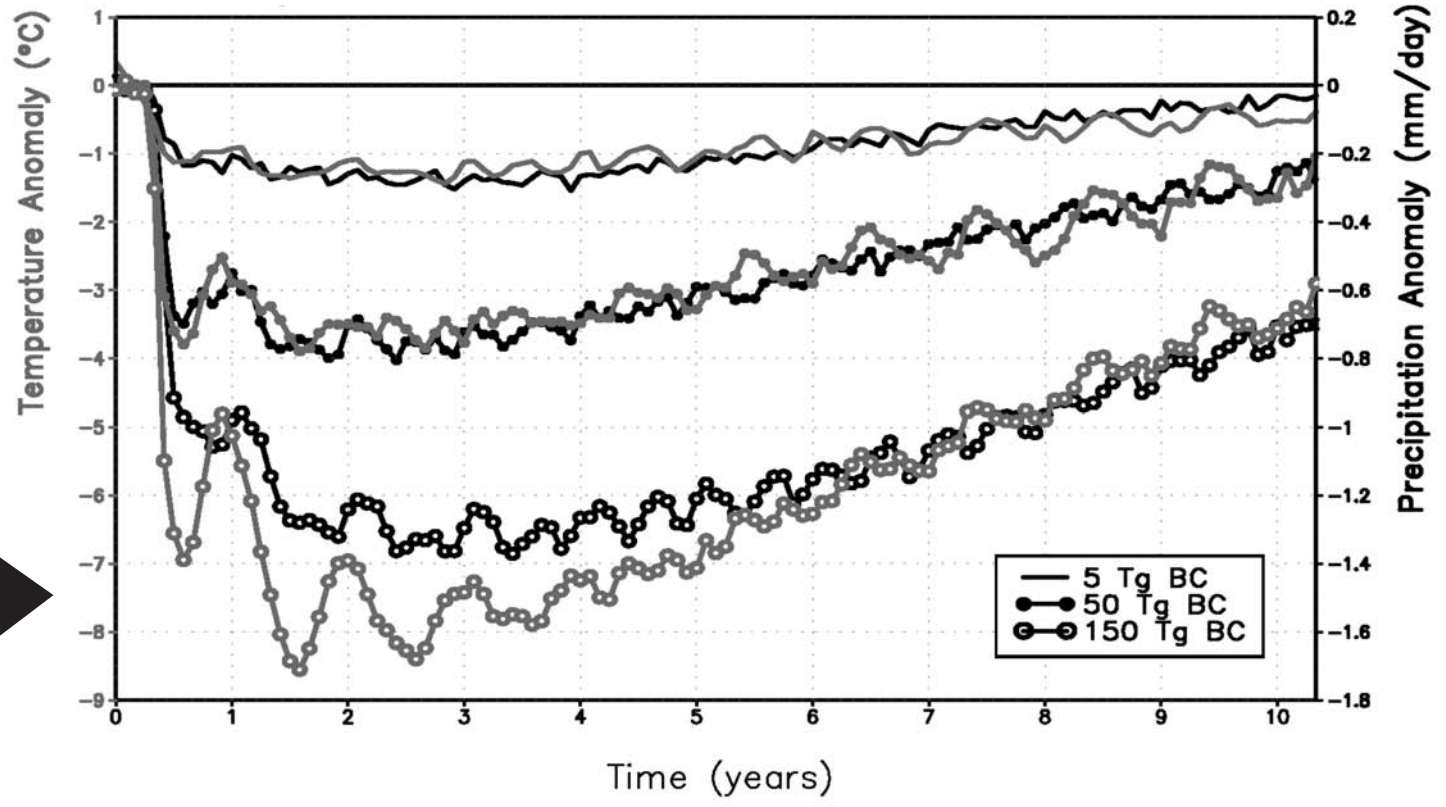
Gradually, working with colleagues in Scientists Against Nuclear Arms (one of SGR's predecessor organisations), we were able to construct a detailed case that even relatively 'modest' nuclear detonations – of the order of hundreds of megatonnes (MT) – over UK cities would cause horrific deaths, injuries and long-term radiation consequences resulting in tens of millions of casualties[3,4].

However, some suspected that the longer-term consequences might be even worse due to adverse effects upon the global climate, as a result of widespread fires injecting huge quantities of soot into the upper atmosphere. Climate models were in their infancy by today's standards, but their results were nevertheless chilling. They concluded that as few as several hundred nuclear weapons could trigger a 'nuclear winter' with nightmarish consequences. This realisation was a key factor in dwindling public confidence in, or acceptance of, nuclear weapons.

Box 1 – How big is a megatonne?

One megatonne (MT) is the explosive power of one million tons of TNT – an energy release of 10^{15} calories. The world's current nuclear weapons arsenals total more than 5,000MT, or a little under a tonne of high explosive for every person on the planet[5]. A 'typical' nuclear warhead – such as in the Trident system – is 100kT (0.1MT)[6], or eight times the explosive force of the bomb which devastated Hiroshima[7].

Three climate modelling studies – by two US research groups and one Russian – were especially important[8,9,10]. They showed that a full-scale nuclear war – some 1,000 nuclear warheads exploded over cities and fuel-laden targets such as oil refineries – would cause reductions in surface temperature, precipitation, and insolation (energy from sunlight at the Earth's surface) so large that the climatic



Credit: Alan Robock © – see note 28

Figure 1 – Change of global average surface air temperature (grey lines), and precipitation (black lines) for the 5 Tg BC (black carbon emitted), 50 Tg BC and 150 Tg BC cases.

Box 2 – Calculating the climatic impacts of the firepower of one Trident submarine
(References are given in the text)

1 Trident warhead = 100kT
1 Hiroshima bomb = 12.5kT
i.e. Trident warhead is 8 times greater

Blast area of 1 Trident warhead = $8^{2/3}$x blast area of 1 Hiroshima bomb
i.e. Blast area of 1 Trident warhead = 4 x blast area of 1 Hiroshima bomb

1 Trident submarine carries 48 warheads (= 4.8MT)

Total blast area of Trident submarine's warheads = 4 x 48 = 192 Hiroshima bombs

100 Hiroshima bombs inject 5Tg of soot into atmosphere

Total soot injection due to Trident submarine's warheads:
Low estimate (linear scaling): 5 x 192/100 = 9.6Tg
High estimate (using Postol model): 4 x 5 x 192/100 = 38.4Tg

Interpolating from the simulations of Robock *et al* (2007), the resulting temperature drop would be 1.5-3ºC lasting approximately five years.

consequences could be described as a 'nuclear winter'. The effect would last a year or more and lead to 'darkness at noon' and other severe climatic disturbances. The stratospheric ozone layer would be destroyed, resulting in a major increase in the dangerous ultra-violet radiation reaching ground level. There would be major extinctions of wildlife, and most people on the planet would be in danger of starvation. The political response to these calculations was intense, with some arguing that the results over-emphasised the likely effects. Some even coined the term 'nuclear autumn' to discredit the work[11].

Nuclear winter confirmed

In recent years, of course, attention has shifted from global cooling due to a nuclear conflict to global warming as a result of fossil fuel burning. Research on global warming and climate change has considerably expanded over the last 20 years and, together with huge improvements in computing power, this has led to major advances in climate modelling, greatly increasing our understanding of atmospheric and other key processes.

With these advances, the Canadian organisation Physicians for Global Survival (PGS), SGR and others called for the research on the nuclear winter phenomenon to be updated[12]. In the last couple of years, this has been carried out, with several new studies having now been completed[13,14,15]. These use the latest climate models run over ten-year simulations and with detailed maps outputting average temperatures and rainfall, with more detailed studies for key crop growing regions. Three new scenarios have been published. These calculate the effects of 5,000MT, 1,300MT and 1.5MT (the latter equivalent to 100 x 15kT), resulting in 150Tg, 50Tg and 5Tg of sooty smoke respectively from fires (1Tg = 10^{12} grammes). Most disturbingly, all three simulations result in cooling effects that last not just a year or two, as in the earlier studies, but for *at least a decade*.

At the top end of the spectrum, the two higher scenarios strengthen the basic conclusion that a large-scale nuclear conflict would have devastating climatic consequences (see Figure 1). They would lead to an average global cooling of 3.5-8ºC – a change as great as moving into an Ice Age. This maximum temperature drop would last three or four years, with a return to normal temperatures taking about another seven years. Geographical plots give more detailed estimates. In the UK, for example, the average temperature drop would be about 5ºC during the initial period. The global average summer temperatures would drop by 20-30ºC. In two key crop growing areas, Iowa and Ukraine, detailed simulations show temperatures below freezing for two years and a halving of the growing season respectively, with a drought due to 50-70% reduced rainfall. Continental cooling would decrease or eliminate the land-ocean temperature contrast in the summer and this would wipe out the Indian, African and North American monsoon seasons.

In 1983, the Scope study[16] estimated that the longer-term impacts upon the climate would mean that all survivors of nuclear attacks would have to depend upon food stocks for at least one year. Even assuming that the remaining food was distributed between survivors, the resulting casualty figures were extremely stark. Assuming no food production for one year and minimal food storage, deaths of approximately 90% of global population were estimated. The only exceptions, in this scenario, were areas in latitudes 20-30º South, which includes Australia, New Zealand and parts of southern Africa and South America, where the nuclear winter effects were somewhat less severe and there could be up to 30% survivors.

But the latest calculations mean that survivors would have to rely on stored food for several years, not one. Virtually all farming would cease for over two years, with a dramatically shorter growing season (if any) due to sharply-reduced rainfall for around a decade. To put this into perspective, grain stocks in 2006 were sufficient to feed the world for just 57 days[17]. To compound matters, there would also be major shortages of fertilisers, fuel for machinery, pesticides (but not pests), and seeds, coupled with periods of darkness during daytime, unpredictable frosts, widespread radioactivity and toxic chemicals, and a food distribution system in chaos.

It is hard to overstate the level of global catastrophe that this would represent.

These results alone need to be brought into the public eye as a shocking reminder of the sheer folly and longer term devastation that a major nuclear conflict would bring, not just to the attacker and the attacked, but every country and region on the planet.

Climatic effects of a regional nuclear conflict

But if this is not shocking enough, research simulating the effects of a 'regional conflict' involving just 100 Hiroshima-sized nuclear weapons (1.5MT in total) concluded that even this could cause significant cooling for several years across the Northern Hemisphere.

Two of the studies mentioned above[18,19] investigated such a scenario. They estimated that such an attack – assumed to target city centres very rich in materials that would burn fiercely – would inject a total weight of smoke into the atmosphere of 5Tg. Their results showed a global cooling for ten years peaking at 1.3ºC. This would still be a major climatic change, especially given the speed at which it would occur. Casualties from blast, fire and radiation due to the nuclear weapons are calculated to be up to a total of 20 million if 'super-cities' such Delhi or Mumbai are included in the target list. The methodology to calculate these figures is very similar to that which we used in the book, *London after the Bomb* in 1982[20].

What could one nuclear-armed Trident submarine do?

After publication of the above results, I decided to estimate what the climatic effects might be using a small number of the larger weapons routinely deployed by the five 'official' nuclear powers. Here I take the example of a UK Trident submarine, carrying its full complement of nuclear weapons. The calculations are given in Box 2 with the explanation as follows.

One Trident submarine is capable of carrying 16 missiles with a total of 48 nuclear warheads, each one of which has a yield of 100kT and can be targeted on a separate city[21].

In order to estimate the climatic impact, we need to calculate how much black carbon (soot) each Trident warhead could send into the atmosphere. The amount of soot created for a given target is proportional to the area set on fire. Robock's 'regional conflict' scenario above used as its basis the firestorm that was witnessed at Hiroshima. Nuclear weapons effects are usually calculated on well known blast-effect scaling laws[22]. Blast damage radii scale as the cube root of the warhead size, thus blast areas scale as square of the cube root (i.e. to the power 2/3). Using the figures in Box 2, we can calculate that one Trident warhead has a blast devastation area four times as large as that in Hiroshima. Using the full complement that can be carried, one Trident submarine can therefore devastate an area 192 times that of Hiroshima. This is roughly twice the regional scenario – which assumed 100 Hiroshima sized bombs – and therefore results in twice the soot injected into the atmosphere. This also means roughly 40 million casualties if densely populated centres are targeted.

However, fire causation and spread is a complex issue and there is reason to believe the impacts could be greater. The Postol super-fire/firestorm spread model[23] predicts that for larger nuclear warheads such as those carried on Trident, fires are likely to rage over an area some 3.5-4 times larger than that estimated from simple scaling-up of the effects of Hiroshima. Taking this important factor into account, one UK Trident submarine could inject not 10Tg of soot into the atmosphere but possibly as much as 38Tg. Interpolating between the 5 and 50Tg scenarios, this magnitude of soot injection seems likely to produce a globally averaged cooling of some 1.5-3ºC over at least five years and shortening of growing seasons by 10-30 days.

It is a shocking revelation that the firepower of just one Trident nuclear submarine could not only devastate 48 cities and cause tens of millions of direct casualties, but also cause a global cooling lasting several years and of a magnitude not seen since the last Ice Age. This would have a tremendous impact on global society and natural ecosystems.

More work is needed to assess in detail the impact that such a cooling would have. As noted above, food supply is particularly vulnerable especially as world grain stocks currently stand at less than 60 days supply – their lowest level for over 30 years[24]. Helfand has estimated that 1 billion deaths could result from food shortages arising from the 'regional conflict' scenario above[25].

Implications for global and national nuclear policy

While the estimates in this article obviously need further analysis and refinement, they are nevertheless robust enough to have important policy implications.

Firstly, this analysis adds yet more weight to the argument that urgent progress is needed in global nuclear disarmament, through the nuclear Non-Proliferation Treaty or, better, through a new nuclear weapons convention. With over 26,000 nuclear weapons still in existence[26], there really should not be any further delay in pursuing this.

Secondly, any nuclear arsenal over about 5MT (i.e. about 50 Trident warheads) should be considered a threat, not just to other states and peoples against which it may be targeted, but also globally through the climatic impacts that could be wrought. The five 'official' nuclear powers – USA, Russia, China, France and the UK – all have arsenals in excess of these levels. It is also possible that the nuclear arsenals of Israel, India and Pakistan each exceed this level[27].

Regional and national instability, such as currently exists in the Middle East or in Pakistan, should be regarded as a potential threat to global society, and the provision of support and resources for peaceful resolution should be given especially high priority.

Finally, this is yet another clear argument against UK plans for Trident replacement. Deploying a weapon capable of devastating the world's climate system is a grossly disproportionate, and perhaps even suicidal, response to uncertain future security concerns. It really is time to put an end to this programme.

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The employment benefits of *not* replacing Trident

Steven Schofield argues that investing the billions earmarked for Trident replacement in alternative sectors would more than offset the job losses in the nuclear weapons sector.

Although the New Labour leadership secured a parliamentary vote in favour of a replacement for Britain's Trident nuclear weapons system, mainly by relying on the Conservatives to counteract a backbench revolt, opposition remains strong. The Scottish National Party administration's determination to prevent Trident warheads being transported through Scotland, and continued campaigns led by peace groups and trade unions against nuclear weapons modernisation, reflect a widespread popular opinion that the UK should be working towards nuclear disarmament rather than nuclear rearmament.

Recently, in support of these efforts, UNISON sponsored research by the Campaign for Nuclear Disarmament (CND) on the employment consequences of a decision to cancel Trident's replacement[1]. The nuclear weapons lobby has always used the spectre of unemployment to mobilise support, particularly in areas where nuclear weapons production is concentrated. However, the report concludes that the threat is greatly exaggerated, and that instead of a multi-billion pound diversion of scarce technological and industrial resources into nuclear modernisation, the government could support a major civil reinvestment programme in areas like renewable energy. This policy would generate tens of thousands of jobs and more than compensate for the run-down and closure of the nuclear weapons network.

Nuclear weapons employment is concentrated in a few locations: the BAE Systems shipyard in Barrow-in-Furness, West Cumbria, where the Trident submarines are constructed; the Devonport Dockyard in Plymouth, recently acquired by Babcock Naval Services, where the submarines undergo major refits; the Clyde Submarine Base at Faslane and Coulport, also run by Babcock Naval Services, responsible for basic maintenance of the submarines and nuclear warheads; and the Atomic Weapons Establishment (AWE) Aldermaston, run by a consortium of Lockheed Martin, BNFL and Serco, for the design, production and testing (and ultimate decommissioning) of warheads.

Under these private-sector corporations, all sites have seen both public investment running into billions of pounds to modernise facilities and a rationalisation of employment since the construction of the first Trident submarines in the late 1980s and 1990s. For example, the workforce at the Barrow shipyard was reduced from 12,500 in 1990 to 3,400 in 2006. Overall employment in the nuclear network has declined from 26,300 to 11,300, a fall of 57%, reflecting the general restructuring of UK arms-related employment during the same period, down from 510,000 to 260,000.

Various estimates have been made for the construction costs of the system to replace Trident, due to become operational in the mid-2020s. The final bill for the original Trident programme was £12.1 billion, which would translate to £15.2 billion in today's money, allowing for inflation. However, costs on major arms projects tend to rise for each successive generation, and the total will probably be higher, in the region of £18-25 billion[2]. For a workforce of 11,000, and even allowing for indirect employment generated at the subcontractor level and through expenditure in the local economies, this represents a very poor rate of employment generation compared to similar investment in the civil sector.

The fundamental argument in the CND/UNISON report is that expenditure on nuclear weapons represents a significant economic opportunity cost. The real security threats facing us in the 21st century are global warming and the accumulating and inter-related environmental catastrophes that threaten our industrial way of life, yet the priorities for government R&D and investment continue to reflect a perverse Cold War militarism[3].

The billions currently devoted to nuclear weapons could be invested in ways that help redefine national and international security and embrace these new challenges. For example, the UK can make a significant contribution to reduced carbon emissions by a rapid expansion of renewable energy power. Energy reviews from the mid-1970s onwards have recognised the massive potential for offshore wind and wave power to satisfy up to 50% of the UK's electricity generation requirements[4]. A multi-billion pound programme of research and investment would help to reduce the UK's carbon emissions, as a contribution to national and international targets, and also guarantee domestic energy production at a time of increasing vulnerability to disruptions and price fluctuations in oil, gas, and uranium supplies.

Photo: Crown Copyright ©

The employment potential of sectors such as renewable energy is far greater than that of a new generation of Trident submarines

Denmark took the decision to reject nuclear power in the 1970s and embarked on a programme of renewable energy production that now provides 25% of its domestic requirements through wind power, as well as becoming the leading exporter of wind turbines in an industry worth over £2 billion a year. A similar investment by our government in offshore wind and wave power could generate 25-30,000 jobs in these new industries by the end of the next decade, more than compensating for the loss of nuclear weapons work.

The lack of a similar strategy for renewable energy since the 1970s is little short of a national economic disaster. Whilst there have been some welcome recent increases in research funding on renewables, the UK starts from such a low base that pressure is growing for a replacement programme of nuclear power stations, which can only divert resources from renewables and further complicate nuclear proliferation issues.

It is now twenty years since the publication by the Barrow Alternative Employment Committee (BAEC) of a report entitled *Oceans of Work*. BAEC was a pioneering trade union group based at the Barrow shipyard that argued for just such a programme of civil marine R&D and renewable energy production to end the dependency of the yard on ballistic missile submarine construction[5]. However, the report was never given serious consideration by the company and the government focused its energy research funding on the nuclear black holes of fast-breeder reactors and fusion power, neither of which have made any practical contribution to energy supply. There is also strong evidence that the nuclear establishment seriously damaged the prospects for renewables by influencing the setting of unrealistic energy production targets for the first generation of wind and wave power prototypes, in order to maintain the nuclear monopoly over government research funds[6].

It is not too late to change course. If we treat the threat from global warming as a national and international emergency, requiring the mobilisation of skills and resources on a scale not previously seen except during wartime, then cancelling Trident can be seen for what it really is: not an economic threat, but an opportunity. No better signal could be given that the UK intends to play a pivotal role in the pursuit of international disarmament and sustainable economic development.

Dr Steven Schofield is co-founder of the Project on Demilitarisation and has published a range of reports on arms conversion and disarmament.

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A big "thank you"

…to all those who responded so generously to SGR's 15th anniversary appeal for funds. We are delighted to announce that as of 18 December the amount raised had reached a grand total of £5,840 which is only £160 short of our target!

Thank you also to all of you who responded to our earlier appeal and to all those who make individual 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.

It is not too late to make a donation. This can be done using the gift aid form sent out with the recent appeal letter.

THANK YOU once again!

Peak oil: why it will not help the climate change problem

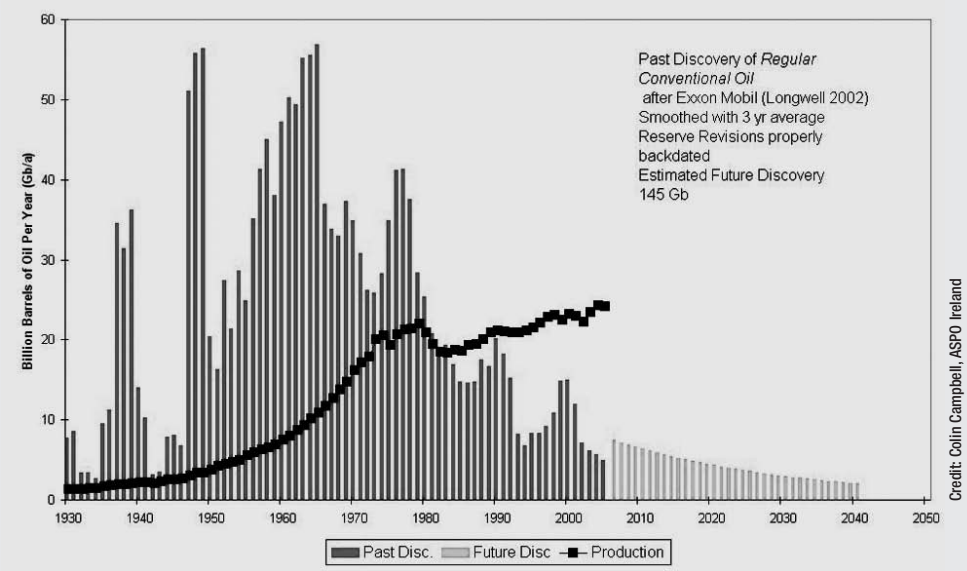
Mandy Meikle argues that the problems of peak oil and climate change must be tackled together.

While climate change is finally starting to receive significant political attention, there is a parallel energy problem that is not: peak oil. Referring to the point at which global production of conventional oil reaches a maximum, peak oil is an economic problem that will compound the environmental and social problems associated with climate change.

Peak oil is about the end of cheap energy – not about oil 'running out'. Addressing peak oil should not divert attention away from tackling climate change: they need to be considered together. After all, we cannot talk about building a low-energy (or low-carbon) future without considering where we will get the energy from to construct such a future.

It is important to distinguish between conventional and non-conventional oil. Peak oil refers to the peak in production of conventional oil: the oil we associate with 'gushers', the oil that fuelled the 20th century. What confuses the issue is that there are also billions of barrels of non-conventional oil yet to be exploited in the form of heavy oils, tar or oil sands, oil shale, bitumen and deep-water reserves (that is, those lying at more that 1,000 feet below the seabed). These non-conventional reserves require more work (i.e. energy input) to yield each unit of usable oil. If that energy comes from fossil fuels, the resulting CO_2 emissions per unit are higher than for conventional oil. (Note that all work done to release energy will result in CO_2 emissions if the energy comes from fossil fuels – whether it is used to extract oil or to build a wind farm.)

Although we do not know exactly when this peak in conventional oil production will occur, we do know that conventional oil *discovery* peaked in 1965, and since 1981 we have been using more oil than we find (see Figure). Peak production arrives when roughly half of the global resource has been extracted. However, we do not know exactly how much oil is left today, how much will be found in the future nor what new technologies will allow more recovery from existing fields. Peak production also depends on rates of consumption. If we drastically reduced our oil consumption then the peak, assuming we have not yet reached it, would be offset somewhat (although this will not help to avert catastrophic climate change if we do so by turning to coal and non-conventional oil for our energy). Similarly, if we continue to pump every barrel we find as fast as we can, the peak will come sooner. So we will only see peak oil through the rear view mirror.



Credit: Colin Campbell, ASPO Ireland

Conventional crude oil – past and future discovery compared with production

Energy return on energy invested (EROEI)

Oil reserves, often called 'reservoirs,' are in fact sedimentary rocks containing oil and gas trapped in tiny, interconnected pores. These reserves exist under great pressure; the first oil to leave a well does so under the influence of that pressure. As nature does most of the work, the 'energy return on the energy invested' (EROEI) is high. As more oil is extracted, this pressure drops and eventually reaches a point where enhanced recovery methods are required, such as injecting water or gas.

The EROEI for conventional oil used to be over 100 – so one unit of energy invested produced 100 units of usable energy returned, leaving 99 units for doing work. Today, discovering and producing oil is increasingly energy-intensive and the EROEI has fallen to below 50. This is still a good energy return when compared with, for example, bio-ethanol[1] but it is considerably less than we have been used to. Although non-conventional oils are more expensive to produce, the price of conventional oil has risen so far that they are now becoming economic to extract. Crude oil hit another new high – $100 per barrel – as this article went to press.

Consider Canada's tar sands, or oil sands as they are increasingly known, which are deposits of sand coated in a bituminous material. They lie in relatively shallow layers ranging from a few metres below the topsoil to several hundred metres down. Oil sand exploitation involves huge, opencast mine workings to extract the deposits, followed by washing in hot water to separate the oil from the sand. The 'oil' released is actually bitumen, a very thick, heavy and sticky hydrocarbon that requires a lot more energy to transform it into useful product than does conventional oil. The extracted bitumen is diluted with a solvent to enable it to be piped to an upgrading facility, where it is hydrogenated to produce synthetic crude oil. Only now is it fit to enter a refinery.

The amount of energy – in the form of gas – required to produce the heat to extract the bitumen and the hydrogen for downstream processing is vast. In a 2004 strategy paper, the Alberta Chamber of Resources announced that oil sand production should reach 5 million barrels per day by 2030, despite also acknowledging that achieving this

would consume 60% of all the gas available in western Canada each year. Even the consultant who wrote the report described this as unsustainable and likened the process to "turning gold into lead"[2].

Two tonnes of oil sand must be mined to yield one barrel of oil. To put this into perspective, while one barrel of conventional oil takes the equivalent of 2.5% of the energy contained within that barrel to produce (EROEI of 40), an average barrel of oil sand oil takes a massive 33%[3], an EROEI of 3. It is hardly surprising that we have not used this resource until now.

Peak oil, EROEI and tackling climate change

There are many reasons to link peak oil and climate change, especially given that peak oil is not about the oil running out but is about its extraction becoming messier and more energy-hungry. The situation raises some big questions. How are we going to reduce CO_2 emissions if we rely increasingly on energy-intensive, non-conventional oils? What about those countries (including China and the USA) that in response to soaring oil prices, plan to extract more coal to make liquid hydrocarbon fuels or to burn directly? What sources of energy will be available to build a new low-energy future, or to relocate vulnerable low-lying communities from coastal locations, or to do to any of the myriad tasks required to mitigate the effects of climate change?

The task ahead of us is vast. As the Arctic ice-cap melts, several countries are vying over who has the mineral rights. Is this tackling climate change?

Action is needed on a number of levels – individual, commercial and political. Sadly, the political will to tackle climate change and the looming energy crisis seriously is absent. There do not appear to be many (or any) businesses planning for a world without cheap energy, in which profits no longer spiral upwards. However, there are glimmers of hope on the horizon.

In 1977, the Centre for Alternative Technology (CAT) in Wales produced Britain's first Alternative Energy Strategy, directed at central government and policy-makers. Sadly, they did not listen. Thirty years on, CAT has developed a new strategy, called 'Zero Carbon Britain', which takes Britain's current fossil fuel consumption down to zero in two decades and powers up renewable energy to meet the reduced energy demand. The report considers Britain as a self-sufficient 'island' (this is just a modelling constraint; in reality we would not exist in energy isolation, making the assumptions in the report more likely to be achievable), and it sets its 20 year strategy within the global strategy of 'Contraction and Convergence'[4]. Energy demand reduction is led by Tradable Energy Quotas (TEQs), a certain amount of which are supplied to individuals for free and to businesses via an auction system according to the carbon budget required to limit global temperature rises to 2°C.

TEQs are only used for buying fuel (e.g. petrol or coal) but because businesses are also included in the scheme, prices on the high street will relate to the embedded energy within various products. Therefore, locally produced, low-energy products would be cheaper than equivalent, imported, energy intensive products. Government also has an allowance of TEQs, meaning that, in theory at least, it too must alter its behaviour. (The downside is that those with the means can buy more than their allocated share of TEQs). It is a fascinating strategy, full of more ideas than there is space to discuss here, but I recommend readers to download a copy of the report, *Zero Carbon Britain*, from the CAT website[5].

What can we do as individuals? Making every effort to cut down personal fossil fuel use (e.g. commuting) offers a good start. One inspiring community response is the growth of the Transition Towns movement[6,7]. Transition Towns are communities (not all 'towns') addressing the transition from oil dependency to a low energy future. People plan how to transform their community into one that is sustainable and abundant in a low energy future in 20 years time. While many Transition Towns have formed in response to concerns about peak oil, they also offer a good strategy for allaying climate change.

The Transition Towns movement started in September 2004, in Kinsale, West Cork, where Rob Hopkins was teaching a permaculture course at the local college. Rob watched the peak oil film, *The End of Suburbia* with his students, which spurred them to devise the Kinsale Energy Descent Action Plan the following year. Rob moved to Devon, where he helped to set up Transition Town Totnes in late 2005, and is now researching a PhD at Plymouth University on energy descent planning.

The Energy Descent Action Plan looks at most aspects of life, including food, energy, tourism, education and health, and is structured in such a way as to enable other communities to adopt a similar process. Given the likely disruptions that loom ahead, a community that is self-reliant for the greatest possible number of its needs will be considerably better prepared than communities dependent on globalised systems for food, energy, transportation, health and housing.

There is a growing wish by people to do something about climate change. I believe that understanding peak oil makes the choice between action and inaction much clearer.

Dr Mandy Meikle is an energy campaigner who works with organisations including Depletion Scotland.

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The CO_2 and H_2O costs of bathing

Alan Cottey compares the main environmental impacts of a bath, a shower and a stand-up wash.

The conventional advice about bathing for those who care about the environment – take a shower instead of a bath – is part of a general increase in consumption, driven by the 'needs' of business-as-usual. Showering can be frugal but it can also be very extravagant, more so than a bath. The traditional 'stand-up wash' has been marginalised, yet it is *much* more economical than a shower or a bath.

In this article, I present numerical information on the use of water, energy and CO_2 in the three cases of taking a bath, a shower and a stand-up wash. Finally, I observe that pleasurable bathing is consistent with having a low environmental impact.

Water

In the UK the average amount of water used[1] in a bath is about 90 litres. I find 80 litres comfortable.

The flow rates for showering vary greatly. They range from 6 to as much as 25 litres per minute (l/min) for power showers, from 6 to 16 l/min for mixer showers and from 2 to 16 l/min for electric showers. In winter, with my electric shower on 'high' power (7.5 kW), the flow rate that produces a comfortably warm (not hot) spray is 5 l/min in early winter and 4 l/min in late winter (when the incoming mains water is colder).

In late spring, I use my shower on its 'medium' setting, which is 4.5 kW. Then, to bring the water to the needed temperature the flow rate is lower, about 2.5 l/min. This mode of showering is notably economical on water and energy. I believe that many people would at first find this low flow rate unacceptable – feeble they might say. Triton's advertising for a power shower declares "enjoy up to 14 litres of water a minute to really kick start your day". I find however that a gentle shower is quiet and the peace is energising.

The water and energy used in showering is of course proportional to time. One is advised not to take longer than necessary and 5 to 10 minutes is commonly suggested. I consider that about 7 minutes is sufficient.

For a stand-up wash, I use three small amounts of water for washing and rinsing, 8 litres in all.

Energy

A bath thermometer shows the suitable range to be 36°C (warm) to 40°C (hot). I find 36°C to be comfortable for a bath or a shower (measured in a jug at the spray exit). I use a start temperature of 43°C for stand-up (the basin soon cools the water). These numbers apply in winter, and the mains water will typically be coming in at about 12°C.

In summer the situation is very different as the mains water is warmer and in hot weather needs only a small boost to its temperature – and in very hot weather none at all, in which case there is essentially no energy use but one should at this time be especially mindful of water use.

The energy embodied in the hot water is in every case the product of the amount of water used, the temperature rise and a constant. An electric shower is nearly 100% efficient; that is, the electrical energy needed is simply the energy embodied in the hot water. For gas heating (of tap water or mixer shower water) one must allow for the efficiency of the boiler and here one can refer to the SEDBUK database[2]. One should also allow for the efficiency of transfer of heat from boiler output to tap or mixer shower and here it will probably be necessary to resort to a guess, based on pipe length. For my own estimates (bath and basin hot water being provided by a gas central heating boiler) I reduced the boiler efficiency of 69%[3] to an overall efficiency of 60%.

Conversion from energy to CO_2

In the UK, such conversions are published by DEFRA[4]. They advise that the mass of CO_2 emitted per kWh for grid electricity, natural gas and fuel oil are 0.43, 0.19 and 0.27 kg respectively.

For me, allowing for the above estimate of 60% gas-energy-to-hot-water-at-tap efficiency, the relevant conversion factors are, for the shower 0.43 kg CO_2 per kWh, and for bath or stand-up wash 0.32 kg CO_2 per kWh (of energy in the hot water).

Pulling the numbers together

Using these numbers, I estimate my bathing water use and associated CO_2 emissions to be as in Table 1 (below). For comparison, I also include shower and bath figures for A N Other, who has a mixer shower and an efficient condensing gas boiler. A N Other showers for 10 minutes with a flow rate 10 l/min at 40°C (hot!) and, for a bath, uses 90 litres of water at temperature 36°C.

Table 1 – Comparison of water and energy use in bathing in winter

	Water (litres)	CO_2 (kg)
Stand-up wash	8	0.09
Shower:		
- Alan	23	0.34
- A N Other	100	0.77
Bath:		
- Alan	80	0.72
- A N Other	90	0.61

In this article I have concentrated on the numbers, but...

Pleasure!

For me, mindful bathing is a great pleasure and frugality can be practised in a gentle, peaceful way that is more pleasurable than 'kick start your day'. Ringing the changes between stand-up, shower and the occasional soapless bath for pleasure is indeed more interesting than daily showering. I have written more elsewhere on the political, hedonistic and spiritual aspects of bathing[5].

Dr Alan Cottey is a member of SGR's Committee and a Fellow at the University of East Anglia.

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Undermining democracy in the planning process

David Grove examines the government's recent white paper on planning and finds much cause for concern.

Ever since the historic Town and Country Planning Act of 1947, all applications to develop land, including changes in the type of use, have to be determined either by elected local councils or by a minister responsible to Parliament. But if the government has its way, this will no longer apply to schemes for what it calls 'nationally significant infrastructure' including power stations (such as nuclear), major roads and railways, airports and seaports. This is the most radical proposal in the recent white paper, *Planning for a Sustainable Future*[1].

Airport expansion is likely to become easier under government planning reforms

The intention is to establish an Infrastructure Planning Commission (IPC) of appointed experts who will decide on all major applications. The IPC will be accountable to a minister for its general functioning but not for specific decisions. It will accept written submissions from interested parties, but they may appear in person only at the IPC's discretion: the cherished 'right to be heard' will disappear. Provided that a proposed development conforms to government guidelines, the IPC can turn it down only if its impacts would conflict with relevant European or domestic law, or with human rights.

As most commentators on the white paper have pointed out, the IPC would end direct democratic accountability for decisions on some of the most controversial projects, such as nuclear power stations and airport extensions. The government's justification for this drastic step is to avoid undue delay and uncertainty. It cites long-running planning inquiries like those for the fifth terminal at Heathrow and the container port at Dibden Bay. But these were exceptional. Planning procedures are only one of the reasons for the long time taken to get some projects off the ground: funding difficulties and political differences are also often to blame.

Under existing law, much could be done to simplify and speed up planning inquiries. Use of a Planning Inquiry Commission would have some of the advantages the white paper claims for the proposed IPC, in particular the power of the inspector to take the lead in questioning applicants and objectors, avoiding some of the disadvantages of the confrontational procedure at normal public inquiries. This would ensure that both local and national concerns are fully considered without undermining democratic accountability.

The white paper proposes that the IPC should be guided by government statements of policy on energy, ports, roads, etc., approved by parliament. With their narrow focus and different time scales, these statements would not easily show how projects in one sector relate to those in other sectors, e.g. airports to motorways, and even more importantly to the changing distribution of population and economic activity. These fundamental issues can be resolved only through a national plan – or spatial framework in the current jargon. Such a strategy has been strongly advocated by, among others, the Royal Town Planning Institute, the Town and Country Planning Association, and the Royal Institution of Chartered Surveyors. SGR has also argued for this approach in its response to the white paper[2]. Though Scotland and Wales already have national planning frameworks, the white paper is silent on the matter. Perhaps that is because the preparation of a national plan would immediately raise the issue of the wide discrepancies in economic performance and living standards between the English regions.

The need for greater speed and certainty in determining planning applications is also cited as the reason for other proposals in the white paper. We are told that because of globalisation and new technology, business needs to respond more quickly to changing market conditions. So planning must have a new culture that gives greater emphasis to economic considerations. "A prosperous and competitive economy" may well be helpful in securing the government's stated aim of "social justice and a fairer, more equal society". However, at a time when worldwide economic growth is pressing on natural resources and exacerbating climate change, when growing luxury for some co-exists with poverty for many, it is unwise to assume – as the white paper seems to do – that *any* growth proposed by a potential developer is necessarily to be welcomed. We shall have to wait for the promised new Planning Policy Statement *Planning for Economic Development* to judge whether the culture change the government has in mind will contribute to its stated aim of integrating the economic, social and environmental dimensions of sustainable development.

A greater emphasis on economic considerations also has implications for regional balance. For example, if it becomes easier to secure planning consent for developments in South East England this is likely to result in fewer projects in other regions. The white paper is silent on such repercussions, which of course can only be dealt with in the context of a national strategy.

There is much fine sounding rhetoric in the white paper, including the aim that planning should be used by local councils as a principal tool in a great effort at 'place-shaping'. It may be doubted whether this is compatible with giving priority to whatever private developers choose to propose.

David Grove is an economist who worked for 45 years in urban and regional planning, with local authorities, development corporations, and private consultants.

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Stop press!

As we went to press, the government announced in the Queen's speech that it will be bringing forward a planning reform bill in this parliament to enact the recommendations of the white paper.

Measures of success: two steps closer to ending the arms trade

Beccie D'Cunha describes two recent, important victories.

The last few months have been uplifting ones for anti-arms trade campaigners. Following a high-profile campaign co-ordinated by Campaign Against Arms Trade (CAAT), global publishing company Reed Elsevier announced on 1 June that it would stop organising arms fairs. Then, while CAAT was still celebrating the Reed success, Prime Minister Gordon Brown announced on 25 July that the Defence Export Services Organisation (DESO) – the UK government's arms sales unit, also in CAAT's sights – would be closed by the end of 2007.

How the Reed campaign was won

The keystone of CAAT's campaign against Reed Elsevier's activities was its spotlight on the incompatibility of the company's involvement in the arms trade with its position as the largest publisher of medical, scientific and other professional journals. In his announcement, chief executive of Reed Elsevier, Sir Crispin Davis said: *"It has become increasingly clear that growing numbers of important customers and authors have very real concerns about our involvement in the defence exhibitions business. We have listened closely to these concerns and this has led us to conclude that the defence shows are no longer compatible with Reed Elsevier's position as a leading publisher of scientific, medical, legal and business content."*

Launching its campaign in 2005, CAAT's first challenge was to alert people to the issue. Few had heard of Reed Elsevier, let alone realised one of its subsidiaries was involved in the arms trade. The next stage was to engage with Reed's customers, investors and employees. CAAT co-ordinated several public letters signed by high-profile members of different professional groups – including representatives of SGR – who read, contribute to or are involved with Reed's other publishing services. The letters had a two-fold effect: they publicly condemned and embarrassed the company and also spread the message about the campaign to new audiences.

Doctors, writers, academics and investors all lent their support; each week saw letters and petitions from around the world calling on the company to change. Investors began to divest from the company and other grassroots groups also kept up the pressure through vigils, die-ins and pertinent questions at the company's Annual General Meeting. Eventually Reed could not ignore the call.

What it means for the arms trade

By the end of 2007, Reed Elsevier plans to have sold off its five international arms fairs, including London's biennial DSEi (Defence Systems & Equipment International), one of the world's biggest. This is a huge victory for CAAT and has sent a clear signal that the arms trade is not only bad for people, but is bad for business.

How easy it will be to find buyers for the events remains to be seen. The DSEi fair, for one, has become a hot potato and will be further threatened by the closure of DESO, which co-organised it with Reed. Of course, we must keep up the pressure on DSEi – both to dissuade potential buyers and to call for an end to government support for this event – but the exit of Reed Elsevier is a huge step towards de-legitimising this deadly trade.

How the Shut DESO campaign was won

Closing the UK government's arms sales unit has remained a priority since CAAT's inception in 1974. Persistent campaigning over nearly three decades laid the groundwork for success. Nevertheless, when we started our Shut DESO campaign in spring 2006, it was in the daunting knowledge that DESO, like the arms industry it supports, is hugely influential and very much behind curtains: few people had even heard of it. We braced ourselves for the long haul. In fact, it took a little more than a year.

We first targeted the Treasury with a postcard and letter-writing campaign, presenting the economic arguments as well as the ethical ones. We highlighted the government's Comprehensive Spending Review as an opportunity to review DESO's function as a public body. We also knew that although Tony Blair was unlikely to close DESO while in power, Gordon Brown, as probable next Prime Minister, might be more likely to if we could influence him in his Treasury role.

A shorter-term aim of the campaign was to lift DESO out of obscurity. In this we succeeded, through local campaigners organising street polls, stalls, petitions, online campaigns and public meetings; by getting the issue into the national media; by taking to the streets en masse for a DESO action day; by persuading other organisations and political parties to support a statement calling for DESO's closure; and by educating two thirds of MPs through letters and face-to-face lobbying. The resulting understanding of DESO's existence made it harder for the government to justify spending public money on it.

Photo: CAAT

Potential buyers examine a tank at the DSEi Arms Fair 2003

What it means for the arms trade

DESO employs nearly 500 civil servants to sell arms worldwide and to lobby for military exports across government. DESO's website boasts that over 75% of arms export orders to date would not have been achieved without its assistance. With DESO's closure, we have struck at the very heart of the UK arms trade. Evidence of this can be found in press reports of the fury of the arms industry immediately following Brown's announcement.

It is not over yet. We need to keep an eye on what follows DESO and continue to campaign for an end to *all* government subsidies and support for the arms trade. But the demise of DESO is a significant achievement, especially considering the massive counter-lobby of arms companies.

Ongoing support is vital to CAAT's work. For more information, CAAT's contact details are below.

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US 'missile defence' in Europe: who needs it?

David Webb suggests current US plans for missile defence may cause more problems than they solve.

The controversy surrounding US plans to position components of its missile defence system in Central Europe has attracted a lot of media coverage in recent weeks – but little discussion or debate in the parliaments of Europe, despite concerns about the risks and doubts about the benefits.

New European bases

The Bush administration claims that it needs new bases in states formerly allied to the Soviet Union in order to protect most of Europe and continental US from a potential long range missile attack by Iran.

It plans to install a radar system in a forward position somewhere close to Iran in order to provide early-warning and cueing information for an enormous X-band radar installation, which is currently situated at the Missile Test Range in the Pacific. The X-band radar would be upgraded and moved to a site near Prague in the Czech Republic.

X-band radars operate in the gigahertz frequency range. They are designed to resolve details of targets to within 0.2-0.3m with the aim of differentiating warheads from decoys. Information from these radars would be used to target accurately around ten missile interceptors, to be located at a site in northern Poland. These installations would be in addition to the two bases at Fylingdales and Menwith Hill in North Yorkshire, which the US is already permitted to use for missile defence.

When Defence Minister Des Browne announced in July that permission had been given for the US to use the electronic surveillance base at Menwith Hill for missile defence, it came as no surprise. A relay station was already established there for space-based, infra-red early warning and tracking satellites; most of the required equipment was therefore installed. The willingness of the UK government to fall in line with US plans was also apparent, illustrated by various news reports and statements in the House of Commons. Many of them point to ongoing discussions with the US on how the UK can become more involved – even by offering to host interceptors.

Yet none of these decisions has been based on any discussion or debate in parliament. It is possible that the government considered the two-month 'consultation period' in 2001 sufficient, which followed the US request to upgrade the radar at Fylingdales. If so, it was an understated affair: the deadline for comments was announced at short notice and coincided with the Christmas holiday period. Despite the large number of objections (including one from SGR) that the Blair government nonetheless received, the plan went ahead, suggesting that the decision had already been made. The upgrade at Fylingdales is now complete. As soon as testing is concluded, it will become integrated into US missile defence.

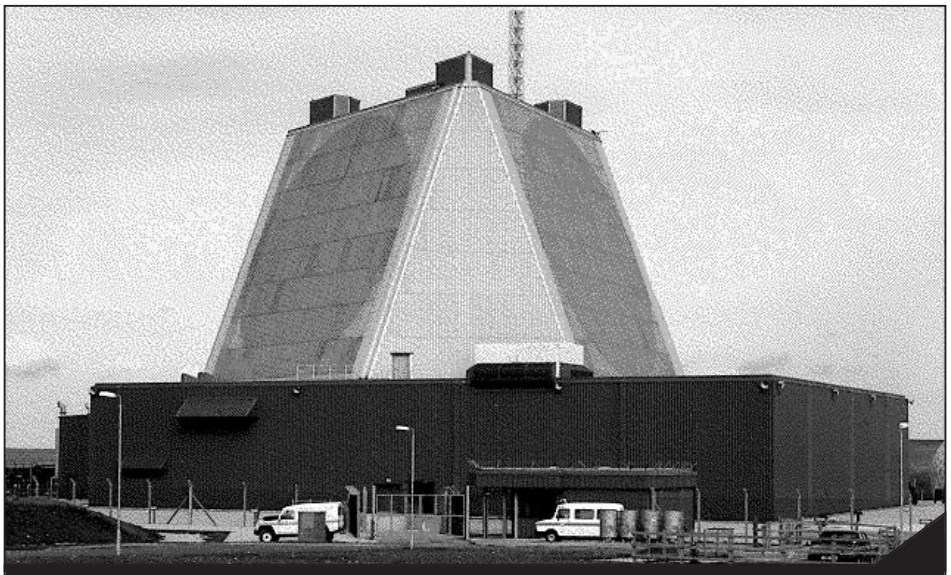
This lack of debate is typical and widespread across Europe. Not only that, countries are making their own decisions without consultation with their European partners, despite the fact that all European countries will be affected by the decision of any individual state to participate in the scheme.

Tension with Russia

These moves are also causing considerable problems with relations between the US and Russia. Although the US insists its proposals are only aimed at Iran, President Putin has expressed strong reservations, indicating that he sees the deployment to be at least partly directed towards Russia. He has suspended Russia's participation in the Conventional Forces in Europe (CFE) treaty[1]. He has also threatened to withdraw from the Intermediate-Range Nuclear Forces (INF) treaty – which eliminated a whole class of nuclear weapons from Europe[2] – and to aim Russian missiles at European targets once again. Speaking in Lisbon in October, the Russian president even compared the current situation with the 1962 Cuban missile crisis.

Why are the Russians so concerned? Joseph Gerson has recently described[3] how every US president since Truman has threatened to use nuclear weapons in order to get its way on some issue or another. If missile defence is viewed as a system that could allow the US to threaten to use nuclear weapons and reduce the fear of retaliation, then it is not surprising that certain nations, faced with a US pre-emptive policy and doctrine of 'full spectrum dominance', are suspicious of its motives.

In a recent article[4] US scientists George Lewis and Ted Postol examine how the Russian military might analyse the situation. They suggest that the Russians could readily conclude that, although the system may be deployed against Iranian missiles, it could also be used to counter Russia's nuclear weapons. They point out that current plans for a European missile defence system could not cope with the number of missiles in the Russian arsenal. However, a National Security Presidential Directive signed by President Bush in December 2002 states that current deployment of missile defences is just a starting point for future improved and expanded systems. In addition, Lewis and Postol claim that the two-stage interceptors planned for Poland are derivatives of the Minuteman series of Intercontinental Ballistic Missiles (ICBMs) and, if fitted with a kill vehicle (the component that seeks and intercepts the oncoming



An upgrade of the radar has taken place at the Fylindales base in North Yorkshire

missile), rather than a nuclear payload, could reach speeds 40% greater than a Russian ICBM on its way to the US.

Therefore it is possible that Poland-based interceptors could catch SS-25 ICBMs launched from silos situated west of the Ural mountains. Postol had previously presented this analysis at a seminar in Washington in August[5] when he pointed out that the US Missile Defence Agency had overstated the speed of Russian ICBMs by 15% and underestimated the speed of proposed US interceptor missiles by 30% to demonstrate that the system posed no threat to Russian missiles.

Whether the US has Russia in its sights or whether Russia is being oversensitive, the basis for tension is plain. In addition, polls and press reports have made it clear that while the governments of Poland and the Czech Republic are fully behind the US proposals, the citizens of those countries are far from happy.

One or other of these factors may have encouraged President Putin to suggest in May that instead of installing a new radar in the Czech Republic, the US could use a Russian early-warning radar in Azerbaijan. In June, he extended this offer to include a second, more modern early-warning radar at Armavir, Russia. He also stated that Russia would not object to US interceptors being stationed in Iraq, Turkey or other southern European locations and suggested that Russia would be willing to run joint early-warning centres in Moscow and Brussels. His proposals focused on the co-operative monitoring and assessment of the Iranian missile threat and eliminated the potential threat to Russian ICBMs from Europe-based interceptors. Radars in Armavir and Azerbaijan are close to Iran and could be enhanced by installing mobile X-band radars. In addition, such a configuration could cover all of Europe whereas current US plans need to be augmented by other, short-range systems to fill in gaps.

The response from the US has been ambivalent. Speaking in Prague in October after meeting the Czech Prime Minister, Defence Secretary Robert Gates said that the US would consider tying together activation of the sites in Poland and the Czech Republic with definitive proof of the threat from Iran. However, President Bush, speaking in Washington, restated US claims that the planned system is necessary to guard against an imminent threat, and overturned the acknowledgement that any Iranian missile threat is unproven.

Permission was given in the summer for the Menwith Hill base in North Yorkshire to be used as part of the missile defence system

Alternatives to missile defence

The US appears to be sticking to an uncompromising line, but other issues may catalyse a revision. As this article went to press, the Pentagon was having difficulty getting funding for the scheme approved through Congress.

If it fails, there are other approaches the US and UK governments could consider. Rather than fuel an arms race by developing missile defence systems that encourage more missiles to be built, we could work collaboratively to eradicate the need for them in the first place.

If we are concerned about nuclear weapons proliferation we can vigorously pursue a Fissile Material Cut-Off Treaty, develop new international monitoring systems, and abide by and strengthen the Nuclear Non-Proliferation Treaty. If we are worried about ballistic missiles we can negotiate a new Anti-Ballistic Missile Treaty or a missile test ban, and work for missile-free zones. We could make a real attempt to rid the world once and for all from the threat of nuclear annihilation by seriously pursuing a Nuclear Weapons Convention.

This would seem to be a more sensible and sustainable way of behaving, one that would avoid fuelling the suspicion and distrust caused by the current strategies, and that would have benefits for all.

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2. The 1987 INF treaty between the USA and the Soviet Union removed all nuclear weapons and their delivery systems with ranges between 500 and 5,500 kilometres. Nearly 2,700 missiles were eliminated. For more information, see: http://www.state.gov/www/global/arms/treaties/inf1.html
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Postol's original presentation is at http://russianforces.org/files/BriefOnEastEuropeMissileDefenseProposal_August24,2007_FinalReduced.pdf

Further reading

Center for Defense Information missile defence web pages:
http://www.cdi.org/program/index.cfm?programid=6

Union of Concerned Scientists missile defence webpages:
http://www.ucsusa.org/global_security/missile_defense/

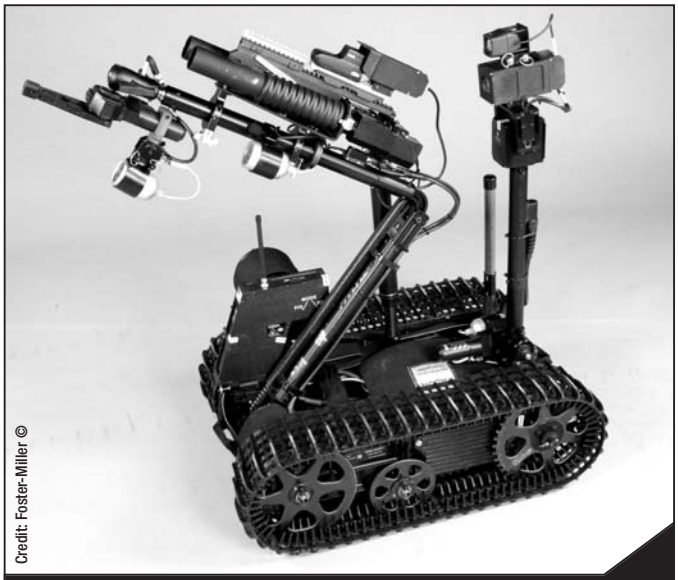
US Missile Defense Agency website:
http://www.mda.mil/

Yorkshire CND 'Star Wars' web pages:
http://cndyorks.gn.apc.org/md/news.htm

The grim reality of robots at war

Noel Sharkey gives a stark warning about the potential for a robot arms race.

The deployment of armed robots in Iraq is the latest step on a dangerous path into a 'brave new world' where robots decide who, where and when to kill. South Korea and Israel have both deployed armed robot border guards, while other nations – including China, India, Russia, Singapore, and the UK – increasingly use military robots. They are integral to the massive US$230 billion Future Combat Systems project to develop unmanned vehicles that can strike from the air, under the sea and on land. The US congress want one-third of ground combat vehicles unmanned by 2015[1]. Over 4,000 robots are serving in Iraq at present[2], with others in Afghanistan – and now they are being armed (see picture).



Credit: Foster-Miller ©

Over 4,000 robots are now serving in Iraq

Most robots currently in combat are extensions of human fighters who control the application of lethal force. When a semi-autonomous MQ-1 Predator self-navigated above a car full of al-Qaida suspects in 2002, the decision to vaporise them with Hellfire missiles was made by pilots 7,000 miles away. Predator attack-planes have flown many missions since then with inevitable civilian deaths, yet working with remote-controlled or semi-autonomous machines carries only the same ethical responsibilities as a traditional air strike.

But fully autonomous robots that make their own decisions about lethality are high on the US military agenda. The US National Research Council advises "aggressively exploiting the considerable warfighting benefits offered by autonomous vehicles"[3]. They are cheap to manufacture, require fewer personnel and, according to the navy, perform better in complex missions. Thus one battlefield soldier could start a large-scale robot attack in the air and on the ground.

This is dangerous new territory for warfare. Having worked in artificial intelligence (AI) for decades, the idea of a robot deciding on human termination terrifies me. Policymakers seem to have an understanding of AI that lies in the realms of science fiction and myth. A recent US Navy document suggests that the critical issue is for autonomous systems to be able to identify the legality of targets. Their answer to the ethical problems is simply, "Let men target men" and "Let machines target machines". In reality, a robot could not pinpoint a weapon without pinpointing the person using it or even discriminate between weapons and non-weapons. A child in an urban war zone could be zapped because she points her ice cream at a robot to share. A robot could be tricked into killing innocent civilians.

A different approach being considered by the US Army is to equip the robot soldiers with an artificial conscience that allows them to make ethical decisions about the application of lethal force. But I have grave doubts about the outcome. Apart from an inability to make the appropriate discrimination between innocents and combatants in the fog of war, robot warriors could have to make decisions in very complex and entirely unpredictable circumstances. The number of possible moral and ethical problems in a military operations environment laden with civilians could approach the infinite. Many different events can occur simultaneously, giving rise to unpredictable or chaotic robot behaviour.

I am concerned that military public relations will use the promise of projects like the 'artificial conscience' to allay opposition to the premature use of autonomous weapons. Arguments would follow the technological imperative that because it will soon be possible to have smart robots that can discriminate legitimate targets, we should proceed now regardless of collateral casualties.

The laws of war enshrined in the Geneva and Hague conventions and the various protocols legislate soldiers' behaviour in armed conflicts – what they should and should not do and who and what their legitimate targets can be. And there are specific laws to deal with the use and prohibition of weapons. But autonomous robots are a special case unlike any weapons before them. They fall foul of three of the fundamental ethical precepts of a 'just war': they are not under control of the chain of command; they cannot reliably discriminate between combatants and non-combatants; and there is no quantitative measure that a robot could use to objectively determine needless, superfluous or disproportionate suffering. Additionally it is difficult, if not impossible, to allocate responsibility for fatal mishaps. The robot might absurdly get blamed or it might be tricked by the enemy into wrongful killing.

We are going to give decisions on human fatality to machines that are not bright enough to be called stupid. With prices falling and the technology becoming easier, we are beginning to see a robot arms race that will be difficult to stop. We will get little warning of the deployment of autonomous robot weapons. It is likely to happen piecemeal and leave us sleepwalking into an unprecedented ethical and moral minefield. It is imperative that we have international discussion and legislation about how, where and when autonomous robots can be applied in war before it is too late.

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Can large-scale biofuels be sustainable?

Almuth Ernsting assesses the current social and environmental impacts of large-scale biofuel production and questions whether 'sustainability standards' will be enough to prevent serious problems.

Credit: Biofuelwatch

Paramilitaries have been involved in seizing land for palm oil plantations in Columbia

Few people now doubt that some of the biofuels used in Europe are produced at the expense of rainforests and other biodiverse ecosystems and that those should not be promoted as 'green energy'. Nobody would choose to buy biodiesel made from Colombian palm oil grown on illegal plantations owned by companies linked to paramilitaries who have killed, evicted and tortured local people to grab their land. Governments and international organisations are therefore keen to develop 'sustainability standards'. In Europe, various countries including the UK are planning 'reporting requirements' on environmental and social sustainability. The European Commission has proposed environmental standards, though they do not include human rights and food security. Can sustainability guarantees work and ensure that biofuels will contribute to climate change mitigation and socially just development?

Scepticism has come from many grassroots organisations, non-governmental organisations (NGOs) and even a report published by the Organisation for Economic Co-operation and Development (OECD). Sustainability guarantees have to overcome three major hurdles if they are truly to protect the environment and communities. Firstly, policies need to be shaped by the people whose livelihoods will be directly affected by biofuel production. Secondly, a policy instrument needs to be found that can stop deforestation, biodiversity losses, evictions of local communities, human rights abuses, malnutrition and starvation due to biofuels. And finally, the scale and type of biofuel production chosen must be sustainable in view of the planet's finite resources.

Credit: Biofuelwatch ©

Local communities in Columbia protest that land in a 'humanitarian zone' has been illegally taken for palm oil cultivation

How high are the stakes?

This year's Amazon fires have been amongst the worst on record – 54% up from 2006. The dramatic increase in fires has been restricted to three soya-producing states[1]. A study by NASA scientists published last year showed a clear correlation between the price of soya and the rate of Amazon destruction[2]. Soya prices have risen steeply this year and there is strong evidence that the price rise is driven by the booming demand for biofuels[3]. Dr Nepstad, head of the Woods Hole Research Institute's Amazon programme, has warned that droughts, coupled with high deforestation could within two decades lead to a 'nightmare scenario' where the rainfall cycle on which the forest depends collapses[4]. This would trigger widespread vegetation die-back. Evapo-transpiration from the Amazon forest plays an essential role in maintaining rainfall patterns across the Amazon basin and probably over a much wider region, from Argentina to the US Midwest. Once tree cover has been reduced beyond a critical threshold, rainfall might no longer be sufficient to sustain the Amazon forest and much of Latin American and US agriculture. The Amazon forest alone stores up to 120 billion tonnes of carbon in vegetation and soil – enough to push global temperatures well above 2ºC warming, regardless of any possible cuts to fossil fuel emissions. Changed rainfall patterns caused by a possible Amazon die-back could push the world into instant food shortages. By expanding biofuels without true 'sustainability guarantees', we are literally playing with fire.

Other possible 'negative impacts' include starvation and tens of millions of refugees: Jean Ziegler, Special Rapporteur to the UN on the Right to Food, has warned that "here is a great danger for the right to food by the development of biofuels... it [the price] will be paid perhaps by hundreds of thousands of people who will die from hunger."[5] The Chair of the UN Permanent Forum on Indigenous Issues, Victoria Tauli-Corpuz, meantime, warned that 60 million indigenous people worldwide could become biofuel refugees[6].

Those are some of the reasons why over 150 organisations from North and South have signed a "Call for an immediate moratorium on EU incentives for agrofuels, EU imports of agrofuels and EU agroenergy monocultures"[7]. A moratorium means nothing other than applying the precautionary principle, to which the EU has committed itself. During the most recent meeting of the Convention on Biological Diversity, several governments demanded that the precautionary principle should be applied to biofuels, and most recently, Jean Ziegler has called for a five-year moratorium in front of the UN General Assembly.

Who decides what is sustainable?

Communities in the global South are most directly affected by biofuel production, because the highest-yield biofuel feedstocks grow in the tropics, and most of the future biofuel expansion is therefore planned

Credit: Biofuelwatch

Could unsustainable agriculture, such as this eucalyptus plantation in Uruguay, expand with the development of second-generation biofuels?

for Asia, Latin America and Africa. Any policy regarding 'sustainable biofuel production' will have little legitimacy unless it is shaped by the people whose livelihoods will be directly affected. European member states, the EU and international agencies have been developing their own proposals with scant regard for the views of communities in the global South. Hundreds of southern NGOs have signed declarations demanding an end to EU biofuel targets and objecting to us trying to solve our own energy problems at the expense food production, land rights and environment in the South[8]. Those voices have been consistently ignored by policy makers.

Certification – a wish-list or a meaningful policy instrument?

Earlier this year, the United Nations published their report, *Sustainable Bioenergy: A Framework for Decision Makers*[9]. The report warns: "Unless new policies are enacted to protect threatened lands, secure socially acceptable land use, and steer bioenergy development in a sustainable direction overall, the environmental and social damage could in some cases outweigh the benefits" and calls for "internationally agreed standards and other certification models". The report lists the negative impacts that much be avoided, but makes no concrete policy recommendations. Most reports on 'sustainability standards' amount to similar wish-lists but offer no blueprint for avoiding negative and even catastrophic impacts.

There is no precedent for mandatory certification, and experience with voluntary certification schemes gives no grounds for optimism. For example, the Forest Stewardship Council (FSC) certification has been in operation since 1993 yet the International Tropical Timber Association reported in 2006 that less than 5% of tropical forests were sustainably managed, a definition in which they included the timber industry in Malaysia, a country where the rate of deforestation increased by 85% between 2000 and 2005. A recent report[10] from the OECD and the UN Food and Agriculture Organisation warns: "Sustainability criteria are meaningless unless an adequate policy instrument is developed... Though theoretically possible, reliance on certification schemes to ensure the sustainable production of biofuels is not a realistic safeguard". Accountability and verification of the entire production chain have caused serious problems for the FSC.

And there are two even greater hurdles. Firstly, certification would need to be compatible with World Trade Organisation (WTO) rules. The WTO is biased against government 'interference' in international trade and there is no sign that the EU wants to risk WTO adjudication over biofuels. Secondly, certification would need to address the indirect impacts of biofuel production. In the Amazon, for example, soya is the main driver for deforestation. Soya prices are rising to a large part because US farmers have switched from soya to corn for ethanol. Rainforest is being burnt and cleared for soya plantation, but even more is destroyed as a result of soya displacing other types of agricultural activities, including cattle ranching, elsewhere in Brazil and forcing these into the Amazon basin. Sugar ethanol expansion is having a similar effect. Some sugar cane is being legally grown in the Amazon, but far more important is the displacement of agriculture from northern Brazil into the rainforest[11]. Micro life-cycle studies for corn ethanol will not reveal the impact on Amazon deforestation, nor will greenhouse-gas standards show whether sugar cane grown in Sao Paulo drives cattle-ranchers into the Amazon. Methodologies to assess the 'greenhouse gas balance' of different biofuels will be highly unreliable unless they take into account those indirect impacts.

Are some biofuel crops or technologies inherently sustainable?

Some biofuels made from waste are undoubtedly sustainable, although they can only meet a small part of our energy demand. Using waste vegetable oil for transport fuel and sewage and manure for biogas will reduce methane emissions and should be promoted.

There is little evidence that any biofuel crops are inherently sustainable. Rainforest destruction and displacement of communities and food production are due to monoculture expansion, not to the wrong choice of crops. Sugar cane, as mentioned above, has the highest energy yields of all ethanol feedstocks, but is one of the drivers of deforestation in Brazil. It is also linked to extremely poor working conditions, severe health problems amongst plantation workers, thousands of documented deaths from over-working, and instances of slavery.

Jatropha is widely promoted as a crop that will grow on marginal lands and will not compete with food. The Indian government seek to convert 13.5 million hectares of 'wasteland' to jatropha by 2012. Local NGOs have warned that this definition includes common lands and forests on which farmers, pastoralists and indigenous peoples depend for their livelihoods. Already there are reports of companies pressurising farmers into signing over their land[12].

Second generation solid biomass-to-liquid biofuels, such as cellulosic ethanol, are not yet commercially available but are widely claimed to be more sustainable. So far, it takes more energy to turn solid biomass into biodiesel or ethanol than is gained from it. Companies are heavily investing in genetic engineering and synthetic biology to try and overcome plant self-defence mechanisms that have been developed for probably one billion years. Possible safety hazards of GM microbes, fungi and GE trees being developed for cellulosic ethanol have not been assessed. If a technological breakthrough turned cellulosic ethanol into an energy source, this would almost certainly lead to a massive expansion in monoculture tree plantations, such as eucalyptus. Already, tree plantations are a major cause for ecosystem destruction, biodiversity losses, falling water tables, displacement of local people and soil erosion in many countries, particularly in the global South. We certainly cannot assume that cellulosic ethanol will be inherently sustainable.

How much biofuel is sustainable?

One question rarely asked by governments is how much biofuel could in theory be produced sustainably. Already, human use of freshwater, soil erosion rates, climate and biodiversity impacts of nitrate fertilisers, and land-use for agricultural monocultures are by all standards unsustainable. 'Optimistic' bioenergy forecasts are based on the presumption that agricultural production will continue to increase and that we can produce more crops without using more land. This optimism is not based on facts. 2007 will be the third consecutive year with world grain production below 2004 peak levels. Climate change, groundwater depletion and soil depletion are already reducing yields and harvests in many parts of the world. One recent study finds that humans already use 23.8% of the net primary productivity of the terrestrial biosphere, causing severe ecosystem degradation and bio-geochemical changes, and that large-scale biomass expansion would greatly increase those pressures[13]. There is little question that local communities in low-energy societies can benefit from growing crops for biofuels sustainably as part of mixed farming systems and on a small scale. It really is extremely doubtful, though, that biofuels can be sustainably ramped up to replace a substantial portion of today's fossil fuel use on a warming planet which is rapidly losing cropland to desertification, and which is already seeing its ecosystems destroyed by agriculture at an unprecedented rate.

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Credit: Biofuelwatch

Protestors against biofuel agriculture in Argentina

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The universal ethical code for scientists – how good is it?

Stuart Parkinson examines the new ethical code for scientists and engineers and asks: just how good is an ethical code that doesn't prohibit work on weapons of mass destruction?

Last March, the then Chief Scientific Advisor to the UK government, Sir David King, launched the 'Universal ethical code for scientists' – see box. This new voluntary code is intended to raise the profile of broad ethical concerns within the science and technology community. Specifically, it is aimed at "anyone whose work uses scientific methods, including social, natural, medical and veterinary sciences, engineering and mathematics"[1]. Since its launch, various professional science and engineering bodies have endorsed and started to promote the code. On the face of it, this is a long overdue recognition of the importance of ethical issues in science and technology. But is this initiative as groundbreaking as its proponents argue? Or could it actually do more harm than good?

Beyond narrow professional ethics

Let's start with the positive. The code goes beyond the conventional ethical codes in the science and engineering professions, which can generally be summed up as 'do your job well'. Notably, the section on 'Respect for life, the law and the public good' clearly acknowledges that scientists have much broader responsibilities to society. The code also acknowledges the importance of communication – wisely avoiding the condescending approach of the 'public understanding of science' campaigns of the past by actually pointing out the importance of listening! It is also heartening to see that the code recommends that any conflicts of interest should be declared: an area in which many professional institutions and academic journals have fallen well short in this age of rapid commercialisation of science.

Contributing to the public good?

However, the code does have some major shortcomings. Probably the most glaring example is that it does not prohibit all work on weapons of mass destruction. Given that this is a code promoted by an office of the UK government – a government which, of course, continues to deploy nuclear weapons (and plans to do so for at least another 50 years) – one cannot help thinking that political expediency has played a critical role in the formation of the code.

Indeed, a careful reading of the 'public good' section of the code demonstrates this all too clearly. Effectively, whether an activity is ethical or not is simply being framed in terms of its legality. Do we really need an ethical code simply to tell us to abide by the law?[3] Beyond this, signatories to the code only commit themselves to "minimise and justify any adverse effect… on people, animals or the environment". One cannot help thinking that scientists should at least be signing up to a commitment along the lines of "make a positive contribution to the well-being of people, animals and the environment".

The basic problem is that this part of the code is not based on clear ethical principles like, for example, the Hippocratic Oath for medical doctors.

Rigour, respect and responsibility: a universal ethical code for scientists[2]

Rigour, honesty and integrity

- Act with skill and care in all scientific work. Maintain up to date skills and assist their development in others.
- Take steps to prevent corrupt practices and professional misconduct. Declare conflicts of interest.
- Be alert to the ways in which research derives from and affects the work of other people, and respect the rights and reputations of others.

Respect for life, the law and the public good

- Ensure that your work is lawful and justified.
- Minimise and justify any adverse effect your work may have on people, animals and the natural environment.

Responsible communication: listening and informing

- Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others.
- Do not knowingly mislead, or allow others to be misled, about scientific matters. Present and review scientific evidence, theory or interpretation honestly and accurately.

Instead we have wording which, in short, is trying not to offend any current professional group.

Restoring public trust

But even if the code is generally quite weak in certain respects, perhaps overall it will make a positive difference? Speaking about the code last March, David King emphasised that one of the beneficial effects of the code that he intended would be an improvement in public trust of science[4]. He highlighted some recent cases that had shaken public confidence, particularly the MMR vaccine-autism scare, arguing that in this case professional misconduct combined with bad journalism were mainly to blame. The universal ethical code, he argued, would at least help to tackle the professional misconduct.

One has to question, however, whether such a broad code (and a voluntary one at that) is an appropriate way of dealing with professional misconduct. Arguably, much more detailed – profession-specific – codes are far more suitable. But there is a more insidious issue here. While cases such as plagiarism and data falsification are relatively straightforward to deal with through codes of conduct, situations where a scientist obtains results which seem to contradict accepted orthodoxy are far more complex. In the latter, there is a real risk that legitimate scientific debate could be stifled.

And is King right to believe that public trust could be restored by the universal ethical code? I believe he is missing the point. Public trust in science is largely determined by the extent to which it is seen to be acting in the public interest and, critically, whether it is seen to be serving those who might be acting against the public interest. It is notable, for example, that opinion polls show that industry scientists and government scientists are generally trusted much less than those based at universities[5]. However, with universities being strongly encouraged to be involved in more commercial work, trust in academics is being eroded. Perhaps what is really needed are much clearer boundaries between academics and industrialists?

Will the code make any difference?

Another argument King has put forward for the code is its use in the education of scientists. True, a broadly-based ethical code could make a useful contribution – but one has to question if the current flawed document is the right approach.

Back in 2003, a report[6] from a working group of the UN Educational, Scientific and Cultural Organisation (UNESCO) recommended that all university students should take at least an elementary course in ethics. This is where the educational effort should really be focused so that in-depth learning of the range of ethical issues and practices can take place.

In conclusion, it is hard to be enthusiastic about this code. It is very weak on issues of 'public good', and hence fails to challenge many of the ethically questionable activities in which some scientists and engineers are involved. Furthermore, it is open to abuse through the potential for it to be used to stifle legitimate – but uncomfortable – scientific debate. Its value for dealing with professional misconduct or making a significant contribution to education is also questionable. In short, it is more a product of messy political compromise than a clear statement of principles, and hence is likely to do little to encourage the professions to pursue more ethical activities.

Indeed, this case neatly demonstrates the need for organisations like SGR – to stimulate the debate that the 'scientific establishment' shies away from, to carry out educational work on key ethical issues, and to provide a support network for ethically-concerned professionals.

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Military R&D

...continued from front page

industrialised countries spent a total of $85 billion on military R&D, but only $50 billion on R&D for health and environmental protection, and less than $1 billion on R&D for renewable energy – see Figure 1 on p.1. The data for later years is less complete, but that which is available indicates that this huge imbalance is continuing. In making this comparison, we compiled statistics from three sources: the Organisation for Economic Co-operation and Development (OECD); the International Energy Agency; and the American Association for the Advancement of Science (AAAS). Full references are given in the SGR briefing.

The situation in the UK is similarly disturbing. In 2004/05, government spending on R&D for 'defence' purposes was approximately £2.6 billion compared with only £1.4 billion for health and environmental protection. Government spending on renewable energy R&D climbed to only £37 million in 2005 – equivalent to less than 2% of the government's military R&D budget. Meanwhile, figures from the UK's Department for International Development show that its research budget was less than £100 million in 2005 – equivalent to less than 4% of the military spend. Again full references are given in the SGR briefing.

The briefing also highlights the fact that, despite the entry into force of the new UK Freedom of Information Act, the ability to obtain detailed information on military involvement in R&D, especially within universities, remains highly problematic and further reform is needed. SGR's is pursuing further research in this area – see p.3.

In conclusion, the briefing argues that a major shift in scientific and engineering resources away from the military and towards areas that support social justice and environmental protection is long overdue.

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Science and technology policies for the anti-terrorism era

Andrew D James (Editor)

IOS Press NATO Science Series, 2006, 191 + viii pp., £78.00, ISBN 1-58603-646-7 (hardback)

The events of 11 September 2001 in the USA, and subsequent atrocities worldwide, have profoundly changed the way national security is framed. The resultant global 'War on Terror' has, among other effects, threatened human rights and how science and technology function.

Two specific aspects of the 'War on Terror' markedly influence science and technology, especially in the USA. Firstly, there has been a pronounced securitisation of science, technology and their research cultures, as widely reported in professional journals like Nature and Science. Secondly, there has been the development of a high-technology homeland-security industry. Both processes contribute to a mounting global military burden, which in 2006 passed $1 trillion – with the USA contributing almost half. The global security market in the same year was thought to be worth around $60 billion.

Science, engineering and technology have long played a pivotal role in supporting military objectives, which since 9/11 increasingly include anti-terrorism activities, producing a burgeoning homeland security business. In September 2004, a NATO Advanced Research Workshop was held in Manchester (UK) to "critically consider the science and technology policies necessary for defence against terrorism and other threats to security; to assess the priorities for governments, universities, national laboratories and industrial firms; to identify how governments and the science and technology community can most effectively work together to enhance our security; and to share the experiences of policy makers and policy analysts".

To cover all this in a book of less than 200 pages is a tall order. The volume has been edited by Andrew James of Manchester Business School and comprises 14 chapters. Seven of the authors come from North America and five from Europe. The North American contributors tend to dwell on the work of the Homeland Security Department without standing back to assess the global picture.

The chapters are divided into five parts:

1) introduction to some of the key issues which are discussed in the book;
2) the role of science and technology R&D in security;
3) public policy responses to security threats (focusing on homeland security);
4) international co-operation (again using homeland security as the model); and
5) the governance of science and technology in light of the security threats that face the world.

The quality of the contributions is very uneven, with the best and most thoughtful coming from four contributors: Andrew James gives a well argued 'broad brush' account of various issues which impact on scientific work in the post-9/11 world, especially the culture of research that thrives on openness and exchange of people and ideas, and how this itself supports security and democracy; Alastair Hay provides an overview of the issues of chemical and biological threats and the terrorist potential in the UK; Albert Teich from the American Association for the Advancement of Science (AAAS) describes the hysterical way the Bush administration introduced new laws and tightened enforcement of many others as a 'response' to 9/11, despite the likely damage to science. Lastly Brian Rappert gives an excellent, well argued, detailed account of life sciences research and the potential impact of this on national security. None of these authors underplays the complexities of trying to balance security and the essential nature of science and technology. These clear accounts of some of the issues arising from undertaking science and technology in a climate that places terrorism as the major security threat raise profound and important questions. These four essays would be reason enough to purchase the book because, although there has been some discussion about the securitisation of science and technology (e.g. in reports from the Royal Society), it is valuable to have a range of views gathered together, with full references.

However, there are weaknesses in the book, some essays being quite narrowly focused and some poorly written. I have four criticisms of this important book as follows.

Firstly, there are rather sketchy and one-sided accounts of the phenomenon of 'terrorism' but no fully-explored definition of it. Does the 'average' terrorist have the knowledge and resources to construct an effective bioweapon? What about state-sponsored terrorism, briefly touched upon in Rappert's essay but largely missing from other parts of the book? The book is full of descriptions of possible breaches of security and the potential for research data being used by terrorists but there is no in-depth discussion of the steps from research to weaponisation and use.

Secondly, as Brian Rappert points out, discussions about policy and controls on research and publishing data are in their infancy (see p. 181) but we need to have a far wider debate about science, its transparency and its role in modern society, not just in relation to possible terrorist threats. Additionally, a great deal of the research with homeland security funding throws up serious questions about abrogating a number of international treaties, not least the Biological and Toxic Weapons Convention. What is the value and safety of such research? Bioscience research can both hinder and aid security concerns and it is difficult to make such research secure without endangering openness and public scrutiny.

Thirdly, mention is made in several places in the book of the pressing need for ethical standards in science and technology, but only to prevent material and information getting into the hands of a terrorist. However, ethical standards are needed across science for a number of reasons essential to building a safer world. Is it acceptable to obtain funding from powerful military corporations for weapons research? Is it sensible to fund military research when other threats such as global warming are consistently underfunded? None of the contributors really grasps such issues.

Finally, the discussion of reliance upon high-technology warfare is dealt with in the most superficial fashion in the essay by Richard Bitzinger. This subject is central to the theme of the book but none of the drawbacks are mentioned; glib references to technology transfer abound and the author uncritically accepts that conflict is best addressed in this way.

On balance, the book provides a challenge to address the issues arising from rapid developments across science and technology and the need for building a secure and sustainable world. It goes a long way – thanks to the contributions from Brian Rappert, the AAAS and the Royal Society – in examining the emerging security dilemmas posed by advances in the biosciences but there are too many unexamined areas. As a society, we need to support a more ethical science that considers a broad view of security and peace.

Chris Langley

The no-nonsense guide to science

Jerome Ravetz

New Internationalist Publications Ltd., 2006, 144 pp., £6.99, ISBN 978-1904456469

In this book, which provides an insightful introduction to the philosophy of science, author Dr Jerome Ravetz is critical towards science but does not reject it, as post-modernists do. He acknowledges "the great achievements of science of the past and present, and the continuing great excitement and promise of the scientific endeavour" but argues that scientists and engineers should be more constructive partners in solving urgent problems.

This is a fruitful approach, especially if it is intended to encourage scientists and engineers to think critically about their fields. The book also criticises one of the central dogmas of conventional theories of the philosophy of science, which is the clear-cut distinction between facts and values and the implicit support this lends to the idea that science is value-free.

Ravetz challenges this dichotomy on empirical grounds. He points to the tendency for new scientific knowledge often to be controversial, and observes that claims made by one research group might well be contradicted by the results of others. This is especially likely when the issue at stake informs political decision-making and is hence (potentially) part of the public debate. The discourses on climate change and genetically-modified foodstuffs illustrate this point: what some perceive as facts are often entangled with political ideology, financial interests, disciplinary background, affiliation to a particular social class, and so on. Ravetz does not claim that scientific results per se are controversial, but rather illustrates that describing science as a practice that produces 'objective' scientific results produces a definition of science that is too narrow.

The No-Nonsense Guide to Science offers a broader definition, proposing a distinction between 'normal' and 'post-normal' science. These two science forms differ with regard to two things: the degree of certainty with which posed questions can be answered, and the amount of cultural and financial capital invested in research questions.

'Normal' scientists (regardless of whether they work at a university or in industrial research laboratories) basically solve puzzles – either pure scientific ones or problems related to standard industrial applications. Normal scientific questions have one, and only one, solution; and hence are characterised by little uncertainty. If something goes wrong in the puzzle-solving process it is usually only the individual scientist's reputation or job that is at stake. (In this situation the 'decision stakes' are low: a department is not closed down when something goes wrong). Normal science expresses an instrumental line of reasoning, because it only focuses on how to solve puzzles and problems most efficiently; it does not reflect on why it is important to solve particular puzzles and problems.

'Post-normal' science is, on the other hand, characterised by a high degree of system uncertainty and/or high decision stakes. Whether or not GMO foodstuff is dangerous to human health is a post-normal question partly because it cannot be answered with certainty. We have neither the knowledge nor the methods to give straightforward answers to such questions. It is also a post-normal question because private industry, local farmers, grassroots organisations, governmental agencies and others have big money and reputations invested in the issue.

Post-normal science is not instrumental alone, as it also includes 'value rational' elements. Post-normal questions are often embedded in political decision-making, and are not value neutral. Ravetz gives the following example: "Designing a 'safer' car will not necessarily help those who are liable to be hit by it. In this way, the science is subsidiary to the policy".

A possible output of the endeavours of post-normal science is policy advice. Ravetz discusses the issue of providing quality assurance of such advice, given that it might materialise as legislation and affect many parties. He proposes that an extended peer-review system is set up to improve the quality of output of post-normal science. "For our dialogue on policy issues," he says, "we need participants to engage in a 'negotiation on good faith'. Each advances their case on the basis of their own clear and open perspectives and commitments. All participants recognise their uncertainties and areas of ignorance, and respect the integrity of those with whom they disagree". The outcome of such a process will then be presented to 'the court of public opinion'.

Extended peer-review is, for post-normal science, what scientific peer-review is for normal science. It does not only reflect democratic values. Extended peer-review is also grounded epistemologically, as it is not only the technical/normal-scientific facts that are important for 'science-in-context'. Indeed Ravetz argues, "In policy issues, investigative journalism is a key resource, along with documents that were not originally intended for public view. In addition, there is local knowledge, including the place, its inhabitants of all sorts and species, and its history, traditions and special or sacred values". He denotes this ensemble of empirical insight 'extended facts'.

The No-Nonsense Guide to Science gives by far the best, easily-accessible, critical account of today's techno-science that I have seen. It clearly undresses 'entrepreneurial science' and constructively addresses many political and ethical problems related to this mode of science. I believe the book will help scientists and engineers to navigate responsibly and strongly recommend it.

Tom Børsen

Publication Reviews

Joseph Rotblat: visionary for peace

Reiner Braun, Robert Hinde, David Krieger, Harry Kroto, Sally Milne (editors)

Wiley-VCH, 2007, 355 pp., ISBN 978-3-527-40690-6

The death of Joseph Rotblat in August 2005 at the age of 96 deprived us of one of the most remarkable figures of the atomic age. Sir Joseph had declared his intention to see nuclear weapons abolished in his lifetime but, although he lived long enough to know of the many treaties and decisions limiting the proliferation, testing and potential use of such weapons, his greater dream remained unfulfilled.

This Pugwash-sponsored volume contains a number of personal accounts of his life, work and impact upon others. Part 1 includes seven semi-biographical accounts of his career. Part 2 comprises a set of personal memoirs. Part 3 is an appendix which contains some key writings and contributions, from the Russell-Einstein manifesto of 1955 to his critique of current US nuclear policies at the 2003 Pugwash Conference. The articles vary in length and depth, ranging from fairly detailed accounts of his career (for example by John Finney, Francesco Calogero and Sandra Butcher) through family reminiscence (by Halina Sand, his elder niece), to brief tributes such as Michael Foot's six lines. Yet Rotblat as man and scientist remains something of a mystery. He was old enough to remember some of the cruelty of the Eastern Front in World War I. He lost his wife to the Nazi extermination machine just before World War II because she was briefly unable to travel to join him in the UK for medical reasons, after which it became too late. He carried this terrible memory for the rest of his life and never remarried. He joined the Manhattan Project because of his hatred for the Nazi regime and the danger of a Nazi bomb, and then left it rather suddenly when Germany was defeated, moral doubts having become paramount. Life was difficult for him thereafter and despite a productive post-war academic career he may have missed out on chances that would have been his in less troubled times. Much though this book tells us, a full and critical biography is obviously needed. I would like to know a little more about his science. I would like hints of his inner feelings. His Nobel Prize was for peace – but would he have preferred an award for physics? This may be a heretical thought that he would have rejected if asked, but it would be nice to know. The greater the individual, the more important to understand them personally, to help us in our own much tinier lives. I like this book but look forward to a more in-depth one.

Peter Nicholls

Science in focus: nanoscience and nanotechnology

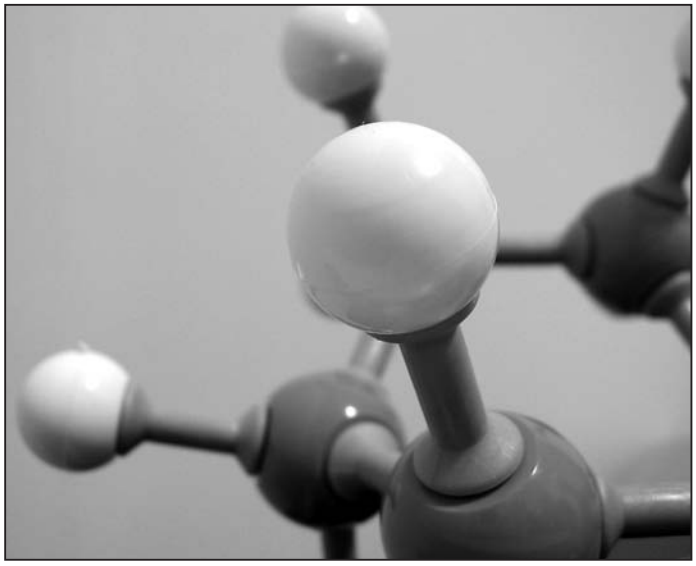
Royal Society of Chemistry and Institute of Physics

Aimed at people who take an interest in the latest scientific developments, this booklet offers an accessible, easy-to-read briefing on nanotechnology in the UK, if somewhat promotional in style.

Put together by the Royal Society of Chemistry and the Institute of Physics, the booklet describes the applications, benefits and potential future benefits of nanotechnology, such as its use in sunscreens, pollution filters and environmental clean-up. Unfortunately, though, it omits to mention the costs of these technologies and gives little attention to the adverse side of some of the products, which can be equivalent in pollution terms to the soot and fumes that other technologies are designed to reduce.

It is not easy to tell from this booklet whether nanotechnology offers the best solutions to the problems facing the world today – such as the growing carbon emissions from so-called developed nations – nor whether advanced nanotechnology instrumentation such as scanning electron microscopes will ever be available to any but the richest of research institutions and companies. While the interest in nanoscience for, say, microelectronics companies is easily understood (not least given their huge investments in nanocomputer research), the field looks unlikely, from my perspective, to play any part in more decentralised science. It falls more into the bracket of 'sexy' research, at times drawing funds from more straightforward and cost-effective solutions to problems. This aspect, unsurprisingly, is also not revealed by the booklet.

This publication appears to be designed to attract young scientists, and perhaps investors, but in my opinion this is a hollow exercise given the forces behind the development of the field and the more pressing challenges that will soon overwhelm such high-cost, low-return research. As for the good work that is being done: the booklet fails to mention, for example, Nottingham University's work in nanotechnology, nor to provide references representative of the body of nano-research published by UK scientists, except for a few 'credits', mostly from Oxford.



It does, however, give a nod to ethical concerns in an extra box at the end.

Ben Samuel

War and peace

Leo Tolstoy First published: 1865-69*

When I started reading Tolstoy's *War and Peace* recently, I was not expecting a novel about Russia in the early nineteenth century to have lessons so relevant to the conflicts of the twentieth century and today. Leo Tolstoy, who himself had served in the army, wrote *War and Peace* in the 1860s about the Napoleonic campaigns culminating in the 1812 invasion of Russia. Despite the immense differences between the society Tolstoy was writing about and today's world, many aspects of people's behaviour – arrogance, ignorance and greed – are readily recognisable. The principal characters, Pierre, the bumbling, overweight, eccentric, enormously wealthy noble who finds his greatest sense of peace when he has lost all as a prisoner of the French, and the beautiful, lively, impulsive Natasha, go through a whole range of often conflicting emotions. The book shows the contrast between the extravagant life of 'society' in Moscow and St. Petersburg and the chaotic bloody battles going on in Russia at the same time.

Although generally characterised as a novel, Tolstoy in a number of places philosophises on the nature of the events. He concludes, in contrast to the historians' views of events being decided by the decisions of a particularly brilliant army commander or emperor, that in fact events were usually decided by a coming together of numerous random events and thousands of individual decisions.

Napoleon's huge army with troops from many countries was drawn deeper and deeper into Russia by the retreat of the Russian army. Napoleon's triumph at capturing Moscow turned to disaster as his army lost its effectiveness after waiting for months for a Russian surrender in a largely burnt-out city. His army, retreating in the Russian winter, hungry and harassed by the local population and partisans, arrived home with only a tiny fraction of the original number having survived.

In the twentieth century, perhaps if Hitler had learned the lessons of *War and Peace*, he would not have risked an invasion of the Soviet Union which ended in the depths of winter leading to his defeat (although freezing of his tanks' diesel fuel was not a contingency Napoleon had to put up with!). Vietnam and the Soviet invasion of Afghanistan showed how difficult it is, even for a vastly superior military force, to hold down a country in face of concerted resistance from the local population. In Iraq today, the world's overwhelmingly most powerful military force is unable to control events. The likelihood of the British army being able to gain and maintain any long-term control in the lawless areas of Afghanistan also seems small.

In the 1980s, when issues of nuclear weapons stationed in Europe were high on the political agenda, an organisation called 'Just Defence' put forward proposals for the UK to adopt a strategy based on well organised defence of the homeland, not requiring nuclear missiles and other offensive capabilities. May be the lessons of *War and Peace* have something to teach us today.

Martin Quick

** Penguin Classics released a new translation by Anthony Briggs in 2006, £9.99, ISBN 978-0141025117*

Concentrating solar power – information kit (CD) TREC-UK, 2006

In SGR Newsletter No.34 (Summer 2007), Gerry Wolff described proposals for very large-scale electricity production by Concentrating Solar Power (CSP) in the Middle East and North Africa (MENA), linked by very high voltage DC transmission lines to power consumers in this region and to all parts of Europe. The CD produced by the Trans-Mediterranean Renewable Energy Cooperation (TREC) presents the results of an extensive study funded by the German Government which gives a good summary of the proposals and detailed reports on CSP's potential role for countries in Europe and the MENA region. In Europe, CSP would complement a wide range of indigenous renewable technologies, providing about 15% of electricity by 2050. In the MENA, CSP would be the dominant source of electricity.

CSP covers technologies where solar energy is concentrated by mirrors onto collectors, heating a working fluid to drive a heat engine, and a number of different systems have been successfully demonstrated. High Voltage DC (HVDC) transmission is a well-known technology, with relatively small losses (3% per 1000km). Possible additional (local) benefits claimed for the technology are desalination of sea water using waste heat, and horticulture benefiting from shade from intense sunlight, under the mirror array.

The report suggests that, given relatively large ($75bn) initial economic support to get the technologies into large-scale production (thus reducing unit costs), there would be very large cost savings relative to a 'business as usual' (mainly fossil fuel generation) scenario from 2020 onwards. There could be considerable social and employment advantages, and political benefits – for example by providing fresh water in dry areas.

While these claims seem reasonable, some questions remain, for example about the doubts that may exist on Europe being dependent for a significant proportion of its electricity supply from areas that might be subject to terrorist activity. One solution suggested by TREC to reduce such a risk (to bury the transmission lines) would be expensive. Plants relying on sea-water cooling would occupy a high proportion of land near the coast (land which is often the most valuable) if they were to supply the amounts of energy suggested and avoid long cooling water pipes. Also, would there be adverse effects in the Mediterranean, with its low water flows, near water-cooled plants emitting large amounts of heat and desalination plants discharging more salt-water? Although not mentioned in the report, parabolic dish Stirling engine CSP and power tower gas turbine systems need not depend on water cooling and do not require large areas of flat land like trough/steam cycle plants. Dish plants can also be installed in small, dispersed modules. These characteristics could make them more suitable for deployment in southern Europe than parabolic trough/steam turbine systems.

There is enough promise in the ideas that the EU should fund at least initial stages of such a programme, maybe with CSP plants in southern Europe and Morocco (which has little gas or oil and is close to mainland Europe) and the first stage of an HVDC network.

Martin Quick

Available free from: http://www.trec-uk.org.uk/ or phone: 01248 712962

Fighting over the leftovers: resource depletion and the potential for conflict

SGR Conference and AGM, University of London Union, 6 October 2007

SGR's conference this year focused on the increasingly important links between the depletion of resources – including water and oil – and possible conflict. The event comprised two keynote speakers in the morning session – Dan Smith of International Alert and Mandy Meikle of Depletion Scotland – with three parallel sessions in the afternoon. SGR's Annual General Meeting took place in between. The event attracted approximately 70 participants.

Climate change and conflict

Dan Smith, Secretary-General of International Alert (a peace-building NGO), spoke about the potential for climate change to lead to conflict.

He began by pointing out that the impacts of climate change are already starting to be seen around the world, and these are undermining the resource base, especially water, with much potential for conflict. He gave examples including the case of water shortages in Peru, where a major retreat in glaciers has led to a reduction in the melt-water upon which local populations depend.

With the time lags in the climate system, it is several decades before much of the impact of carbon emissions is felt by society. So, Smith argued, even if we achieve large cuts in emissions soon, adaptation is still going to be an important part of the response to climate change. Different countries have different capacities to deal with the effects. As an example, he compared the low-lying countries of The Netherlands and Bangladesh. With the former being wealthy, having strong institutions and a peaceful recent past, it is far more capable of adapting to climate change, whereas Bangladesh is unsurprisingly much more vulnerable.

Research conducted by International Alert has pinpointed 46 nations at high risk of armed conflict resulting, in part, from a changing climate. They estimate that a further 56 nations will not cope adequately and will become politically unstable as the climate changes. Armed conflict may also result in these countries.

No war ever has a single cause, Smith said, but climate change can exacerbate other factors leading to violence. For example, in a country where many people are dependent on pastoral and/or agricultural land, they will be vulnerable to the impact of a changing climate on crop yields. This could lead to competition and then hostility between different groups of people. Ethnic and cultural differences could then become emphasised. If political leaders fail to tackle this divide or, worse, actively exploit it, then armed conflict can quickly result. Darfur, Smith argued, is a clear example where this sort of spiral has occurred.

Credit: Harry Tsoumpas

Dan Smith discusses the link between climate change and conflict

How can the potential for conflict be reduced in vulnerable areas? Smith outlined an important strategy which can be successful. During processes of negotiation or reconciliation, joint projects between divided communities can be very important – and these joint projects can be environmentally focused, including adaptation to climate change. It can be the case that an over-arching 'superordinate threat' like climate change can help bring communities together in common action.

Questions from the floor raised issues such as the damaging effect of the arms trade, the fragility of peace processes, environmental debt, the effectiveness of mediation, and funding of development/ peace NGOs to work on environmental issues.

Energy, peak oil and conflict.

The second keynote speaker was Mandy Meikle of Depletion Scotland. She spoke about 'peak oil' and its potential to cause conflict, as well as its relationship to the climate change issue. She emphasised that there were many common aspects between the problems of peak oil and climate change, but that they could only be successfully tackled if they were considered together.

Peak oil is the concept that, at some time, global oil production will reach a peak, after which it becomes progressively more difficult to extract oil and production declines. Many energy analysts believe the peak will occur soon (and some believe it may even have occurred) but economic problems start to become significant before the peak is reached, when demand for oil climbs above the production from easily accessible reserves. With demand from rapidly industrialising countries like China and India increasing, this imbalance may already be starting to occur as witnessed by recent sharp price increases. The rate of extraction of oil has exceeded the rate of discovery of new reserves for many decades. Two-thirds of remaining oil is thought to be in the Middle East (though the reserves of many countries in this region are thought to be overstated) and three-quarters of reserves are in countries that are members of the Organisation for Petroleum Exporting

Countries (OPEC). Even the normally optimistic International Energy Agency believes non-OPEC oil production will peak by 2015, leaving the world very dependent on oil from potentially unstable countries.

There is a high potential for conflict when oil supplies become scarce and oil has been a major factor in recent conflicts, argued Meikle, for example the 1990-91 Gulf War, the current Iraq war (however strenuously denied by politicians!) and in Southern Sudan, where China has been backing the Sudanese government. Oil and gas pipelines are being routed through many unstable countries in Central Asia, and the oil companies have been given rights to protect the pipelines from sabotage with military force.

Although increased oil prices would tend to force demand reduction; increase energy efficiency; and encourage the exploitation of renewables, an arguably more common effect is the wider application of much more energy intensive processes for oil production. Examples of these include exploitation of unconventional sources such as tar sands and conversion of coal to liquid fuels.

In terms of what needs to be done, Dr Meikle said increasing public awareness of the size of the problem was vital to encourage greater acceptance of the need to reduce oil consumption. She briefly discussed the role that the newly emerging 'Transition Towns' network could play in raising this awareness and developing a sense of community in responding to the challenge.

Credit: Harry Tsoumpas

Mandy Meikle assesses whether 'peak oil' could lead to conflict

Credit: Philip Webber

About 70 people took part in SGR's conference in October

More detailed discussion of the relationship between peak oil and climate change can be found in the article on p.11.

Annual General Meeting

The SGR AGM took place after lunch. Philip Webber, Chair of SGR, opened the proceedings, and dealt with the minutes of last year's AGM. Stuart Parkinson, Director of SGR, introduced the Annual Report, summarising the organisation's activity during the period from March 2006 to February 2007. He highlighted successful project work on ethical careers and military influence in science and technology. He also outlined SGR's lobbying and advocacy work on issues ranging from nuclear weapons to climate change. While the parliamentary vote (shortly after the end of the reporting period) in favour of Trident replacement was especially disappointing, he emphasised that other campaign groups had been very appreciative of SGR's work on this issue. Stuart also outlined the organisational development of SGR during this period, which included moving into a new office, recruiting a new staff member, Jane Wilson, and efforts to expand the membership. The accounts were also summarised. The election for this year's National Co-ordinating Committee (NCC) was then held – the new committee is listed on p.3. Thanks were also given to Tim Foxon (who stepped down as Secretary) and George Finch (who stepped down from the NCC) for their many years of service.

Stuart then gave an update on SGR activities from March up until the end of September, especially further activities related to Trident replacement, given there is still a possibility of stopping this. SGR's researcher, Chris Langley, described his recent work examining military involvement in universities. He also pointed out that SGR had launched a new briefing, *More Soldiers in the Laboratory* (see p.1).

Member, David Hookes then outlined a proposal for an 'Alternatives to Trident replacement' competition, whereby students/scientists etc. would be encouraged to submit suggestions for projects that would use the huge amounts of money intended to be spent on Trident for something much more ethical. Discussion of this proposal was generally supportive. It was also suggested that SGR should monitor government proposals for eco-towns.

Water and conflict – past, present and future

This workshop, convened by Philip Webber, had a lively debate about the role of water in conflict creation and resolution, following on from Dan Smith's earlier presentation. The importance of water as a resource in exacerbating conflicts has been highlighted by the Global Policy Forum, the Pacific Institute and WWF, amongst others. Workshop participants highlighted a wide range of water issues, including droughts, floods, water potability and quality, irrigation and fisheries, and water-power, giving rise to different types of conflict, including disputes over access, ownership, infrastructure, disease vectors and eutrophication. Philip highlighted that water access has been used as a tool of war since at least 2500 BC. Several particular cases of water-related conflict were then discussed, including Israel/Palestine, US/Mexico, and in sub-Saharan Africa. Finally, a lively discussion was held on the

Event Reviews

Credit: Harry Tsoumpas

Stuart Parkinson reviews SGR's activities over the reporting year

pros and cons of the proposed Severn Tidal Barrage, following the recent publication of a report on tidal power by the Sustainable Development Commission.

Using less in our homes

Alan Cottey of SGR introduced this workshop by reminding us that sustainable living is as much about the choices we make at an individual level as at governmental and international levels. The discussion group focused on many aspects of sustainable living within the home.

Alan described how he had attended the first 'Camp for Climate Action' (in 2006) and had taken a particular interest in how the camp was seeking to provide an alternative model for green living and stimulate an interest in the personal as well as the political. The workshop then discussed personal hygiene and how we can educate ourselves to use water more frugally when bathing or showering. Many ideas were expounded such as how a basin-and-flannel wash – instead of a shower or bath – can considerably reduce water consumption. (This is discussed in more detail in an article on p.13)

The discussion then widened to others aspects of low-impact living including: solar hot water systems; the energy- and water-efficiency of dishwashers versus hand washing dishes; the sustainability of recycling if waste is shipped to China for processing; and the current regulation and practice related to the recycling of electronic waste and batteries. The workshop participants also discussed the difficulty of trying to lead a 'one-planet' lifestyle when living in rented accommodation and with others less keen on sustainability.

Volunteering for SGR

Stuart Parkinson ran the third workshop whose aim was to discuss SGR activities that are or could be carried out by volunteers, and especially to look at how more SGR members could be encouraged to get involved.

Stuart began by summarising the current activities in which volunteers are involved – including helping to maintain the website, staffing SGR stalls at external events and, of course, being a member of SGR's National Co-ordinating Committee. The ensuing discussion covered a number of areas, including whether volunteer activity would increase if SGR were more decentralised (e.g. had local groups) and whether members were fully aware of the range of volunteer options available. Regarding the latter, it was suggested that more prominence could be given to volunteering in the newsletter (see p.4) and on the email-list, sgrforum. The profile of sgrforum (see back page) could also be greater. The possibility of setting up a web-based discussion forum was also considered. Another suggestion was that lessons could be learnt from events/ forums such as 'Be the change' and 'World café'.

The workshop also discussed a number of ideas for more project-orientated activity. In particular, the Trident competition proposed by David Hookes at the AGM was discussed in more detail, as was possible activity on the eco-towns issue. Another idea was the possibility of SGR setting-up or hosting 'wiki' web-pages for use by members, especially as one of the workshop participants was looking for a way of encouraging discussion of her new online book on the economics of climate change.

Concluding comments

Kate Macintosh, Vice Chair of SGR, summarised the workshops and brought a busy and stimulating day to a close with a vote of thanks to all those whose hard work had made the conference possible, notably Office Manager, Kate Maloney.

Stuart Parkinson, Martin Quick, Tim Foxon, Sean Macintosh, and Anne Stallybrass

Credit: Harry Tsoumpas

The lunch break is a useful opportunity for meeting and networking with like-minded colleagues

Force protection equipment demonstration VI – military technology fair

Stafford Airport, Virginia, USA, August 2007

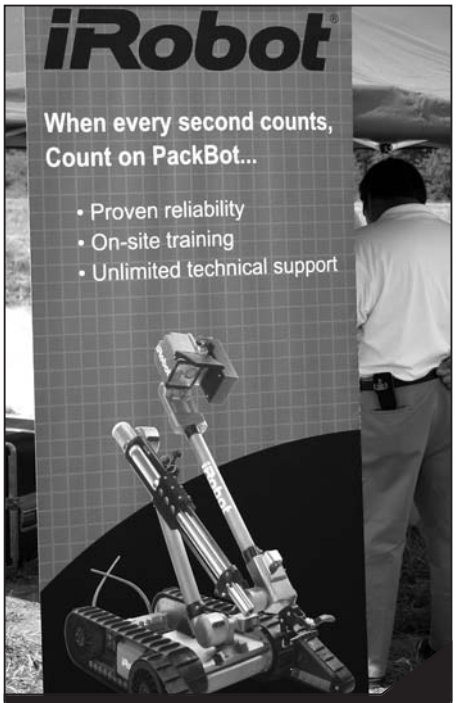
In mid-August, I travelled to Virginia to attend the Force Protection Equipment Demonstration (FPED-VI). It is not often that your research destination is guarded by machine-gun turrets but this was the showcase for the next generation of homeland security technologies. FPED is one of the small number of security venues where the products are tested out.

Attendees get to visit live firing ranges at Quantico of 'X-Files' fame and watch whilst dummies are shot with kinetic weapons, dogs run through walls of fire and various mini-installations are blown up. Visiting FPED-VI is like entering an Aladdin's cave of hi-tech toys or a sci-fi 'total control' nightmare. On display were cameras than can track individuals at huge distances and the next generation of sub-lethal weapons. There was even a device capable of detecting a human heartbeat some 500 metres off. This is classic dual-function technology. I could see positive uses especially when integrated into an aerial platform – large areas of territory in a natural disaster could be searched for survivors, after a hurricane, earthquake, avalanche or flood. However there are potential military applications which are far less palatable: for example, in house-to-house operations, where every occupant is to be liquidated, such a device could easily locate all the beating hearts that are to be silenced.

Credit: Steve Wright

Surveillance systems are advancing very rapidly

Ruggedised mini-robots with cameras were on display that could be thrown through windows and remotely steered to have a good look around. Some of the robots had guns. Of particular interest were the 'iRobot' platforms since the company recently announced it would equip its robots with Taser weapons. This begs the question of whom you take to a tribunal if there is a malfunction and the robot abuses your human rights by shocking you beyond the limits of the law.



Credit: Steve Wright

'iRobot' is to equip its robots with Taser weapons

Unmanned aerial vehicles are a particular feature of these shows and, because of engagements like Iraq, they are being configured to fire guns and bombs for hi-tech target acquisition. They are such a sci-fi system, my automatic reflex is to see them as modern mechanisms of guilt-free assassination. It is only a matter of time before some non-governmental hit-squad, with a high-profile murder in mind, gets hold of one of these aircraft and uses it.

Taser itself is currently promoting the TRAD-Taser 'Remote Area Denial' device which, according to the blurb, "induces neuromuscular incapacitation to engage, delay and arrest individuals". To my knowledge, this is the first time an alternative landmine Taser device has been fielded and it is likely to be the first of many...

Post 9/11, the pace of innovation in security weapons and systems has been frenetic. Technologies were on show that could sniff chemical weapons, recognise car number plates and even a system that could translate American commands into Arabic. (Perhaps I should not have been surprised that it only worked one way.) Expect to see some of this hardware, software and liveware near you, here, soon.

Steve Wright

Credit: Steve Wright

Mobile CCTV camera on an armoured vehicle

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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.

SGR has another e-mail list on Population, Consumption and Values. For more info, or to join this list, please contact Alan Cottey at **AlanC@sgr.org.uk**

Editorial Issues

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

- Stuart Parkinson • Vanessa Spedding
- Kate Maloney • Alasdair Beal • Jane Wilson

The opinions expressed within, and any 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).

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THE QUEEN'S AWARDS FOR ENTERPRISE: SUSTAINABLE DEVELOPMENT 2007

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