Scientists for Global Responsibility

Newsletter No. 28 **November 2003**

The Risk of Nuclear Terrorism

Frank Barnaby explores the ways in which terrorists could seek to use nuclear material. This paper was presented at the SGR Conference "Nuclear Weapons: Issues for UK Policy" in September (see p16).

Mass killing by weapons of mass destruction may fit well into the Armageddon and apocalyptic visions of some religious groups, Christian and Islamic, some of which believe that they are under divine instruction to maximise killing and destruction. There is, therefore, clearly a danger, some would say an inevitability, that terrorists will acquire, or develop and fabricate, and use weapons of mass destruction – chemical, biological or nuclear.

Recent experience - for example, the use of nerve agents by the AUM group in Tokyo and the use of anthrax in the USA - shows that terrorist biological and chemical weapons are unpredictable and difficult to use effectively (i.e. to give a large number of casualties). Effective dispersal of both biological and chemical weapons is difficult. This suggests that chemical and biological weapons will not well serve the purposes of the new terrorists.

To fulfil their aims, therefore, future new terrorists are more likely to make nuclear attacks than biological or chemical ones. Nuclear attacks are not only more likely to succeed but their Armageddon nature is likely to appeal to fundamentalists.

Nuclear terrorism

There are number of nuclear terrorist activities that a terrorist group may become involved in:

- stealing or otherwise acquiring fissile material and fabricating and detonating a primitive nuclear explosive;

Plutonium

- attacking a nuclear-power reactor to spread radioactivity far and wide;
- attacking the high-level radioactive waste tanks at a reprocessing plant to spread the radioactivity in them;
- attacking a plutonium store at a reprocessing plant to spread the plutonium in it;
- stealing or otherwise acquiring a nuclear weapon from the arsenal of a nuclear-weapon power and detonating it; and
- attacking, sabotaging or hijacking a transporter of nuclear weapons or nuclear materials; and
- making and detonating a radiological weapon, commonly called a dirty bomb, to spread radioactive material.

Apart from a dirty bomb, all of these types of nuclear terrorism have the potential to cause large, or quite large, numbers of deaths. Of them, nuclear terrorists would probably prefer to set off a nuclear explosive, perhaps using a stolen nuclear weapon or more likely using a nuclear explosive fabricated by them from acquired fissile material. Terrorists would be satisfied with a nuclear explosive device that is far less sophisticated than the types of nuclear weapons demanded by the military. Whereas the military demand nuclear weapons with predictable explosive yields and very high reliability, most terrorists would be satisfied with a relatively primitive nuclear explosive.

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News from SGR

A few words from the Director..

Stuart Parkinson

The tragedy of the Iraq war struck home to the scientific community with the suicide of Dr David Kelly, the UK's leading biological weapons expert, in July*. Dr Kelly had become embroiled in the Government battle with the BBC over the level of spin in its September dossier on Weapons of Mass Destruction (WMD). The case is an extreme example of the problems faced by scientists involved in work with high political or commercial stakes.

It is clear now, following the revelations from the Hutton inquiry set up to examine the circumstances leading to Dr Kelly's death, that his concerns (and those of SGR as outlined in our briefing, 'Why the war on Iraq is a warning for the planet') about the way the Government was using the evidence were justified. The threat from Iraq's WMD was indeed being over-sold to justify a political decision, i.e. to go to war, that had already been taken.

The parallels between this case and that of the GM science review panel, which hit the headlines around the same time, are disturbing. In the latter case, scientists Prof Carlo Leifert of Newcastle University and Dr Andrew Stirling of Sussex University also found themselves at odds with some powerful political and commercial interests. Prof Leifert resigned from the review panel in June feeling that the gaps in the evidence supporting GM agriculture were not being given due attention because of industry bias on the panel. Meanwhile Dr Stirling was privately warned that future funding of his research would be jeopardised if he continued push such a GM sceptic line on the panel. Again we find strong pressure being brought to bear on scientists who are unwilling to fall in with the prevailing political and commercial thinking on an issue.

These cases show yet again how important it is that powerful political and commercial interests which 'bend' scientific evidence to justify unpopular policies need to be challenged by concerned scientists and citizens through organisations like SGR.

SGR has continued to work across these and other issues. On the question of WMD, SGR's conference on 13th September saw two respected commentators, Dr Frank Barnaby and Prof John Finney, speak on 'The risk of nuclear terrorism' and 'An end to the UK's nuclear weapons' respectively - and articles based on their talks can be found on p1 and p11 SGR has also lent its support to the 'Nuclear weapons awareness programme', a coalition of UK organisations which aims to make nuclear disarmament a high priority political issue in the UK (see p10), and to the 'Biological weapons prevention project', an international coalition which is working towards the abolition of these weapons.

As part of the national 'GM Nation' debate (which resoundingly came out against the commercialisation of GM crops) SGR speakers spoke at three of the local debates and made a submission to the GM science review (see p5).

We've also highlighted some of the wider concerns on arms (see p4), climate change (see p3), and science policy (see p6). We are making good progress on our project 'Understanding the military influence on science and technology', which is beginning to throw up some important new data (see p5). Our publications on ethical careers in science and technology have proven to be even more popular over the past few months, and our work has attracted some very positive media coverage.

Finally, you'll find with this issue some inserts:

- A few copies of SGR's new membership and promotional leaflet. (We hope you like the new eye-catching design!) Please give these to friends and colleagues, or put them on a noticeboard at your place of work or study - remember, non-scientists can also join SGR as associate members.
- A membership questionnaire. We would like to your views on SGR's activities and the services on offer to members, so please fill this in and return it to the SGR office. We intend to use the responses to help improve SGR's effectiveness across all its work areas.

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*SGR issued a statement on David Kelly's case on 24th July, which is available on our web-site at <http://www.sgr.org.uk/press/DavidKelly_24jul03.htm>. Paper copies can be obtained from the SGR office.

SGR AGM 2003

Patrick Nicholson

The AGM took place at the SGR Conference at Friends House in London on September 9th.

Phil Webber (Acting Chair) opened the AGM with brief comments about major developments during the year. SGR now has a part time (50%) Executive Director and a part-time (50%) researcher (Chris Langley). The Administrator's part time post has been expanded from 40% to 50%. Following acceptance of the minutes of the previous AGM, the Annual Report was presented to the meeting. In addition to internal expansion, SGR has been increasingly active in terms of conferences, lectures, website presence, media-work, lobbying and research. The importance of increasing membership in order to capitalise on and expand SGR activities was stressed, with members being asked to take away new SGR promotional material and invite new members to join. The election of the National Co-ordinating Committee took place. All those standing were elected (see below).

Updates were then given on specific SGR activities including the ethical careers guide and briefings, and the research project on vested interests in science and technology. Chris Langley summarised some highlights from his research to date on the Military Influence project.

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National Co-ordinating Committee 2003-4

Chair	**Phil Webber**
Treasurer	**Jenny Nelson**
Secretary	**Tim Foxon**
Members	**Alan Cottey**
	Patricia Hughes
	Patrick Nicholson
	Eva Novotny
	Vanessa Spedding

Climate Change and Energy

Stuart Parkinson

August saw extreme temperatures across Europe, with England recording its highest temperature since records began [1]. In France the heat was estimated to have caused at least 11,000 extra deaths [2]. Across Europe the conditions allowed major forest fires to rage. Unsurprisingly this sparked a discussion on whether the cause of the extreme weather was global warming. The answer from most climate scientists, as on many occasions before, was along the lines of 'we can't say for sure that this particular event has been caused by global warming, but it is the sort of event which we expect to see more often as global warming increases'. From here the mainstream media could have chosen to focus in depth on the problems of a rapidly warming world. They could have pointed to the increasing number of climate-related disasters and how these impact most heavily on poor countries. As an example, they could have pointed to the drought in India last year which affected a massive 300 million people [3]. The media could have also chosen to highlight George Bush's refusal to take any serious action to reduce the USA's huge greenhouse gas emissions despite spending tens of billions on the war in Iraq. Or the media could have focused on Russia dragging its feet over ratification of the Kyoto Protocol, and hence preventing the treaty coming into legal force. Instead much of the mainstream media decided to engage in a debate about whether global warming is really just due to changes in the Sun's output and not greenhouse gases at all. While there are still some scientists who believe this - and it is important that the scientific debate is allowed to continue - this is hardly justification to give such wide coverage to this handful of scientists whose views, if allowed to affect policy, would seriously undermine precautionary efforts to tackle probably the greatest environmental threat facing human society. This is why we added SGR's name to a letter sent by campaign group Rising Tide to the UK's main media outlets criticising their coverage of the issue, and encouraged members of SGR's email-list 'sgrforum' to do likewise.

The issues I've raised above continue to feature in SGR outputs on this topic. For example, in recent months I've been able to raise these concerns in two of my presentations: 'The science and politics of climate change' on a training course for Foreign Office staff; and 'Tackling climate change - the role of the engineer' at the annual conference of the Women's Engineering Society. We shall continue to press the case for concerted action to tackle climate change.

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References

[1] BBC weather online (2003) Sizzling temperatures break UK record. August 11th. <http://news.bbc.co.uk/1/hi/uk/3138865.stm>

[2] BBC news online (2003) 'Over 11,000' dead in French heat. August 29th. <http://news.bbc.co.uk/1/hi/world/europe/3190585.stm>

[3] International Federation of Red Cross and Red Crescent Societies (2003) World Disasters Report 2003. Chapter 8. <http://www.ifrc.org/publicat/wdr2003/>

Arms and Arms Control

Phil Webber

Obviously the main activity over recent months in this area has been our annual conference on 'Nuclear Weapons: Issues for UK Policy' which is covered on p16. Chris Langley's work on the Military Influence project is another major area of activity that is covered elsewhere (p5).

In terms of my own activity, I was invited to speak at the Conflict Research Society annual meeting in September at Hoddesdon Hertforshire on the topic of the war in Iraq. I took the opportunity to develop some thinking about so-called asymmetric conflict - where one side is heavily armed and in normal terms has overwhelming military superiority and where the other is engaging in guerrilla activity or "low level" conflict. The post Iraq situation is an example of this type of conflict. I used our Iraq briefing (see <http://www.sgr.org.uk/ArmsControl/Iraq_planet_warning.htm>) as a starting point to evaluate how far the earlier goals and aims of the Bush and Blair administrations had been reached and to see what could be learned - if anything - about the motives that underlay the conflict. The notes from this will be available on the website as soon as I have completed the updates with the intention of providing a resource for others who may wish to discuss the issues.

In the aftermath of the protests at the huge DSEi arms fair in London, I did an interview for BBC World Service (News Hour 12/9/03) about the links between the military and science. I was in a debate with a scientist who advocated working on military projects but who had no answers to the points that SGR is making (e.g. that arms work increases rather than decreases the likelihood of war).

Post Iraq War

A look back at SGR's Iraq briefing 'Why the war on Iraq is a warning for the planet' shows that our doubts about the Government's justifications for the war were well-founded. Also, it seems is clear now, following the revelations from the Hutton inquiry set up to examine the circumstances leading to Dr Kelly's death, that his concerns about the way the Government was using the evidence were justified. The threat from Iraq's WMD was indeed over-sold to justify a political decision, i.e. to go to war, that had already been taken. In my view, the Hutton enquiry also strengthens the case for a much wider-ranging enquiry into how the Government presented, influenced and used intelligence information. The only arguments that I have seen that seem to hang together are that Blair took a strategic decision to support the US hoping that the UN would fall into line later. In his approach to Parliament he did not trust it to approve going to war with all the facts. He therefore had to put together a case for attack based on incomplete reporting of suspect intelligence, the most obvious example being the allegation of WMDs deployable within 45 minutes.

By leaking information to sections of the press who were ready to print scare stories this then created a feverish atmosphere combined with continual terrorism alerts and practices in which insufficient MPs felt unable to vote against the war.

As I see it this was a war based upon the deliberate manipulation of information to achieve an end with a largely compliant media and a cowed House of Commons. A terrible blow for democracy. If Robin Cook's memoirs are accurate, the situation shortly before the attack was even worse, as Tony Blair was then briefed again and realised that the threat had been over-played. But by then he could not face turning aside - or perhaps this only exposed what he thought anyway - and the die was cast.

A New Arms Race?

The US continued to test elements of its planned missile defence programme and continued its efforts to convince others to take on part of the 'defensive' shield. Depressingly many states now seem to have decided that they would like to be part of this project - or at least they have refused to rule themselves out. For example, Japan, Russia and Australia. There is also support from some European countries. Meanwhile China successfully tested a new multi-warhead missile precisely what is needed to swamp a missile defence system and Pakistan tested a new rocket capable of carrying a nuclear warhead. North Korea announced that it had processed enough nuclear material to make 6 nuclear weapons. Reports indicated that Saudi Arabia was considering obtaining nuclear weapons.

We are witnessing a new arms race which is fuelled by regional conflict (China - Taiwan; India - Pakistan; Israel - Middle East) and by fears of not being part of the US missile system (Australia and Japan). Despite this the system continues to be enormously costly and is by no means near completion.

As if this was not bad enough, continued reports allege that Iran has nuclear material - although in the wake of the lack of evidence of WMD in Iraq, one presumes that governments will find it far harder to justify further military action.

As all the above demonstrates - there is an enormous amount of activity in the arms area and SGR is only able to skim the surface of what is going on. As we recruit more members we could do with finding people who could take on monitoring developments in missile defence and the various regional conflict situations.

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Understanding the Military Influence on Science, Engineering and Technology

Chris Langley

The project began in earnest on 1st July, and is looking at how the military sector - both government bodies and defence corporations - shape and direct science, engineering and technology (SET). The main focus of the work is the UK, but evidence from other countries will also be included.

Despite being less than open about its activities, it is clear that the Government, especially the Ministry of Defence, plays a major role in fostering links between scientists, engineers and the military. One third of public funding for R&D is spent by the MoD, and the MoD employs 40% of Government scientists. The Government has also been responsibility for the setting up (starting in 2000) of the Defence Technology Centres (DTCs) and Towers of Excellence which are collaborations between the MoD, military corporations and universities. The DTCs currently involve 9 universities.

The military corporations also have huge power. BAE systems, for example, sells equipment in 130 countries to the tune of £12 billion annually. Rolls-Royce have set up 19 University Technology Centres (UTCs) in UK universities which also involve military work.

Over the next few months my goals will be to uncover more of this secretive world, and also to compare the funding of military research with sustainable and non-offensive research.

If you would further information on the project, or would like to help (e.g. by researching the military links of your university), please contact me.

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Thinking About an Ethical Career in Science and Technology

Stuart Parkinson

The high demand for SGR's ethical careers material continues unabated! We've now distributed a total of 2000 copies of our three 8-page briefings (on climate change, cleaner technology and animal experiments) since their launch in March, with the majority being electronically downloaded from our web-site. The original 32-page booklet is also still proving popular: the total number distributed has now passed 3200 copies.

The popularity of the publications has been helped by some very positive media coverage with articles in The Times, The Guardian, Ethical Consumer, Next Wave (youth science e-magazine) and several other science/ green publications. Also, in September, I took part in a live debate on BBC Radio Scotland on ethical careers.

Work is continuing on further briefings, although at a slower pace since Vanessa Spedding went on maternity leave in the summer. However she will be back in the New Year and in the meantime we are planning to release a fourth briefing, 'Is your career sustainable?' by Phil Webber, as this newsletter goes to press.

Copies of SGR's ethical careers material can, as ever, be downloaded from our web-site <http://www.sgr.org.uk/ethics.html> or ordered from the SGR office (contact details on back-page).

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GM Issues

Eva Novotny

In June and July, a national debate was held on the future of GM crops in the United Kingdom. There were three strands: an Economics Review, a Science Review and a public debate. The last of these provided an opportunity for the public voice to be heard: the results include the facts that only 8% of respondents were happy to eat GM food, that 95% of respondents were concerned about contamination of non-GM crops and that 91% were concerned about effects on the environment.

Included in the public debate were several official public meetings around the country. Many cities and towns organised their own debates, then sent their results to the review body. SGR participated in a number of such debates: the Director spoke at a public meeting in Lancaster and the GM Co-ordinator spoke at Glastonbury and Poole, as well as attending an official event at Harrogate and a local event in Cambridge. SGR also (as already reported in the preceding Newsletter) sent the results of our research on pollen transport by wind to the Science Review. The GM Science Review First Report has since been published, and we have responded to the section dealing with pollen transport and separation distances required between crops to prevent contamination at a given level. We subsequently sent an Annexe, which

essentially reproduced the calculations on which separation distances for maize are based, demonstrating the shortcomings of those calculations (which had not been explained in the government-commissioned report) and stressing that new experiments and new calculations based on them are essential.

In July, SGR wrote to the Lake District National Park Authority and sent a copy to Cumbria County Council. The letter encouraged them, in their forthcoming debates, to vote against allowing GM plants to be grown in their areas. We were pleased to note that both bodies voted to declare the areas under their control to be GM-free zones.

On 6 November, The Guardian printed in the Comments & Analysis section an article* in which SGR responded to a letter from 114 pro-GM scientists, which they had addressed to Tony Blair and other ministers.

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* see <http://www.guardian.co.uk/comment/story/0,3604,1078617,00.html>

Science Policy

Stuart Parkinson

In July the Office of Science and Technology released "The Forward Look 2003" (OST, 2003) which is a summary of current and planned Government-funded science and technology, including the Research Councils. It adds detail to the promises made in the Government's 2002 spending review to drastically increase the science budget so that in 2004/05 it will stand at £2.5 billion (a 70% real term increase over 1999/2000). There are many positive aspects to the current plans: programmes on sustainable energy, the rural economy and land-use, and improved environmental monitoring to name but three.

However, there are important causes for concern. The most obvious is the size of the R&D budget of the Ministry of Defence (MoD). In 2002/03 it jumped to £2.6 billion, a real term increase of 23% over the previous year which brought it back up to the average level of the 1990's. SGR issued a press release condemning the rise and calling for more to be spent on, for example, cleaner technologies instead. This situation illustrates the importance and timeliness of SGR's ongoing research project 'Understanding the military influence on science and technology' (see p5).

The other main cause for concern in The Forward Look is the emphasis on commercialisation of science and technology. It is clear that short-term economic gain is being prioritised at the expense of issues such as human health, environmental protection and social justice. Again SGR's ongoing research in this area is detailing some of the problems. For more information on this work, please contact Jon Goulding <JonG@sgr.org.uk>.

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Reference

Office of Science and Technology (2003) "The Forward Look 2003: Government-funded science, engineering and technology" <http://www.ost.gov.uk/research/forwardlook03/>

Population, Consumption and Values

Alan Cottey

The Study Group continues to publish, normally monthly, its electronic newsletter. As editor, I welcome submitted items, especially on population, a subject that continues to receive too little attention. The format for items is 'few line snippets' preferable with a web link. Longer items may also be submitted and considered for dissemination in whatever outlet is judged most appropriate. Any SGR member may become a member of the Study Group, and anyone, SGR member or not, may be on the e-mailing list of the newsletter.

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Elsewhere in the News

Aid is becoming politicised

"Humanitarian aid is becoming dangerously politicized" says the latest World Disaster Report. One major ethical concern is the selectivity of emergency aid. Relief peaked at US$ 5.9 billion in 2000, but its global distribution reveals a political rather than moral geography. In 2000, the northern Caucasus received 89 per cent of its UN appeal, Somalia only 22 per cent. Aid per affected person varied from US$ 10 for Uganda to US$ 185 in south-eastern Europe. Within weeks of the fall of Saddam, US $ 1.7 billion had been raised in relief for Iraq, while less than half that had been pledged for 40 million starving Africans.

World Disasters Report 2003 <http://www.ifrc.org/publicat/wdr2003/>

Arms firm waged dirty war on protestors

UK-based defence giant BAE Systems has been linked to a private intelligence-gathering operation that secretly infiltrated anti-arms trade groups.

The company paid hundreds of thousands pounds to a consultancy run by the widow of a wartime secret agent. Agents downloaded computer files, rifled through personal diaries, conducted surveillance on campaigners and passed on bank account details.

For at least four years, BAE were sent regular reports detailing the activities of the Campaign Against Arms Trade (CAAT), a reputable Christian-based group. BAE paid £120,000 a year for this.

A spokeswoman for CAAT said last night that they were deeply shocked: "We cannot understand why anyone would wish to do this as we are a very open organisation."

Sunday Times, 28/9/03

Pakistan test fires missile

Pakistan's military claims to have fired a short-range ballistic missile capable of carrying nuclear warheads. The rocket was named as the surface-to-surface ballistic missile Hatf-III Ghaznavi, with a claimed range of up to 290km.

Pakistan said the timing of the test was based on the country's own missile defence needs and had nothing to do with developments in the region.

Tension with India has eased this year after the two countries moved close to war in 2002. However, renewed violence in Kashmir has slowed progress on peace talks.

India dismissed the test as nothing new.

Guardian, 4/10/03

Pyongyang derides US treaty offer

Diplomatic tension between the US and North Korea worsened after the Pyongyang government dismissed President George Bush's offer of a nuclear treaty as a "laughing matter".

Mr Bush, who was on a five day tour of south-east Asia, called on the communist state to abandon its nuclear weapons programme in return for a written pledge from five countries not to attack.

But this proposal of a "security guarantee" was dismissed out of hand by North Korea, which is demanding a formal treaty that would prevent the US from launching a pre-emptive strike against the isolated country.

Guardian, 22/10/03

France to aim nuclear arms at rogue states

France is to enact a historic shift in military strategy by targeting its nuclear missiles on "rogue states" that have weapons of mass destruction.

France is also looking at developing "mini-nukes".

The cost of maintaining France's nuclear capability absorbs 10% of its £23 billion annual defence budget. Many think the money would be better spent on conventional forces to meet the rising number of humanitarian tasks.

It is not yet clear how this new strategy will be viewed in Washington – as another attempt to exclude the US from Europe's defence or as a welcome recognition of the dangers of rogue states.

Daily Telegraph 28/10/03

"18 years of lies" from Iran over nuclear plans

A report from the International Atomic Energy Agency states that Iran has successfully enriched uranium and extracted plutonium on a laboratory scale. Iran has secretly developed a uranium centrifuge enrichment programme for the past 18 years, and a laser enrichment programme for the past 12 years. However, Mohammed ElBaradi, head of the IAEA, stated that there was no evidence that Iran was pursuing a military programme.

The IAEA report will give ammunition to both sides. The US will see it as evidence that Teheran is aggressively nuclear weapons. Europeans will see it as evidence that pressure has forced Iran to come clean.

Daily Telegraph 12/11/03

Summaries by Patrick Nicholson <PatrickN@sgr.org.uk>

The Risk of Nuclear Terrorism

[continued from front page]

A primitive nuclear explosive

Terrorists could make a nuclear explosive from highly-enriched uranium or plutonium. The most simple nuclear explosive uses the 'gun technique' in which a mass of enriched uranium less than the critical mass is fired, down a gun barrel, for example, into another less-than-critical mass of uranium. The sum of the two masses is greater than critical. When they join together a nuclear explosion occurs.

Highly-enriched uranium is harder to obtain than plutonium. Therefore, terrorists may go for plutonium. The gun technique cannot be used to assemble a super-critical mass of plutonium in a nuclear explosive device; implosion must be used. The implosion technique can, however, be used to assemble a super-critical mass of highly enriched uranium. In a nuclear explosive using the implosion design, a sphere of plutonium or highly-enriched uranium is surrounded by conventional high explosives.

When exploded, the high explosive uniformly compresses the sphere of fissile material. The compression reduces the volume of the sphere of fissile material in the core and increases its density. The critical mass is inversely proportional to the square of the density. The original less-than-critical mass of fissile material will, after compression, become super-critical, and a fission chain reaction and nuclear explosion will take place.

A small group of people with appropriate skills could design and fabricate a crude nuclear explosive. The size of the nuclear explosion from such a crude nuclear device is impossible to predict. But even if it were only equivalent to the explosion of a few tens of tonnes of TNT it would completely devastate the centre of a large city. Such a device would, however, have a strong chance of exploding with an explosive power of at least a hundred tonnes of TNT. Even one thousand tonnes or more equivalent is possible, but unlikely.

It is a sobering fact that the fabrication of a primitive nuclear explosive using plutonium or highly-enriched uranium would require no greater skill than that required for the production and use of the nerve agent produced by the AUM group and set off in the Tokyo underground.

Terrorist attack on a nuclear-power station

Instead of exploding a nuclear weapon, a terrorist group may decide to attack a nuclear facility. It is generally recognised that a terrorist group with significant resources could attack and damage a nuclear-power plant. There is argument, however, about how much damage and how many people would be harmed by such an attack. It is probably true that attacks on nuclear-power plants that could do a great deal of damage and cause many fatalities have a relatively small chance of success. But many believe that the damage caused by and the number of people killed by a successful terrorist attack on a nuclear-power plant could be so catastrophic that even a small risk of such an attack is not acceptable.

There are two potential targets in a nuclear-power station for a terrorist attack: the reactor itself and the ponds storing the spent fuel removed from the reactor. An attack on the reactor could cause the core to go super-critical (as happened during the 1986 accident at the Chernobyl reactor) or cause a loss of the coolant that removes heat from the core of the reactor (as happened during the reactor accident at Three Mile Island).

Spent fuel elements are normally kept in storage ponds for five or ten years under three or so metres of water before they are either finally disposed of in a geological repository or sent to a reprocessing plant where the plutonium inevitably produced in the fuel elements is chemically separated from unused uranium and fission products in the fuel elements. The ponds are normally built close to the reactor building. The buildings containing the spent fuel ponds are less well protected than the reactor and are, therefore, more attractive targets than the reactor building.

Terrorists could target a reactor or spent fuel pond by: using a truck carrying high explosives and exploding it near a critical part of the target; exploding high explosives carried in a light aircraft near a critical part of the target; crashing a high-jacked commercial airliner into the reactor building or spent-fuel pond; attacking the power station with small arms, artillery or missiles and occupying it; or by attacking the power lines carrying electricity into the plant.

Alternatively, a terrorist group may infiltrate some of its members, or sympathisers, into the plant to sabotage it from inside. A saboteur may attack, for example, the systems cooling the reactor core or drain water from the cooling pond. This could cause the temperature of the reactor core to rise, resulting in a release of radioactivity from the core, or cause the temperature of the spent fuel rods to rise, again resulting in a release of radioactivity.

Terrorist attacks on high-level radioactive liquid waste tanks or plutonium stores at Sellafield

It is hard to think of a nuclear terrorist attack which could, at least in theory, be more catastrophic than a successful attack on the tanks at Sellafield that contain the liquid fission products separated from spent reactor fuel elements by the two reprocessing plants.

A major concern after the September 11, 2001 terrorist attacks in New York and Washington is an attack on Sellafield in which a large commercial aircraft, such as a Boeing 747 carrying a full load of fuel, is dived from a high altitude into the liquid high-level radioactive waste (HLW) tanks. A fully laden jumbo-jet travelling at between 200 and 300 metres a second would have a very large momentum and the crash would have a huge impact. In addition, the aircraft may be carrying about 150 tonnes of aviation fuel and the crash would create a very fierce fire.

Highly radioactive liquid waste, fission products arising from the operations of the two reprocessing plants at Sellafield, is stored in 21 water-cooled tanks. Normally, at any one time, fourteen of these tanks are full of liquid fission products; the other seven are kept empty in case it is necessary to empty some of the other tanks.

So far as the contamination of the human environment and damage to human health are concerned, the most important radioisotope in the HLW tanks at Sellafield is caesium-137 (Cs-137). Based on figures published by NIREX in 1998 inventory, the total amount of Cs-137 in the HLW tanks is about 1,980 kilograms. For comparison, the Chernobyl accident released about 25 kilograms of Cs-137. Each HLW tank, therefore, holds about 6 times the amount of Cs-137 as that released by the Chernobyl accident.

According to figures given by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the exposure of people to the radiation emitted by the Cs-137 released during the Chernobyl accident produced a worldwide collective radiation dose of 600,000 person-sieverts over a period of 50 years. The number of fatal cancers produced by the Chernobyl accident is 30,000.

Scaling up the calculated Sellafield release to the Chernobyl accident suggests that a terrorist attack on the HLW tanks could result worldwide in about 170,000 fatal cancers per tank. Depending on the strength and direction of the winds at the time of the release of the radioactivity, these deaths will occur in the United Kingdom, Ireland and parts of Europe and perhaps even further afield.

Terrorist use of a radiological weapon

The simplest and most primitive terrorist nuclear device is a radiological weapon or radiological dispersal device, commonly called a 'dirty bomb'. A "dirty bomb" would consist of a conventional high explosive – for example, semtex, dynamite or TNT, and a quantity of a radioisotope.

Senator Curt Weldon holds a CIA mock-up of a nuclear suitcase bomb

The conventional high explosive is used to spread radioactive contamination. A radiological weapon does not involve a nuclear explosion. Any radioisotope could be used in a dirty bomb. But the most likely one to be used is one that is relatively easily available, has a relatively long half-life, and emits energetic gamma radiation. Suitable ones include caesium-137, cobalt-60, and iridium-192. Strontium-90, which emits electrons (beta particle) and is concentrated in bone, is also a possible candidate.

The detonation of a dirty bomb is unlikely to cause a significant number of casualties. Generally, the explosion of the conventional explosive would most likely cause any immediate deaths or serious injuries. The radioactive material in the bomb would be dispersed into the air but would be soon diluted to relatively low concentrations. If the bomb is exploded in a city, as it almost certainly would be, some people are likely to be exposed to a dose of radiation. But the dose is in most cases likely to be relatively small. A low-level exposure to radiation would slightly increase the long-term risk of cancer.

The main potential impact of a dirty bomb is psychological – it would cause considerable fear, panic and social disruption, exactly the effects terrorists wish to achieve. The public fear of radiation is very great indeed, some say irrationally so.

The explosion of a dirty bomb could result in the contamination of an area of a city with radioactivity. Decontamination is likely to be very costly (costing millions of pounds) and take weeks or, most likely, many months to complete. Radioactive contamination is the most threatening aspect of a dirty bomb.

Measures to counter nuclear terrorism

To effectively counter nuclear terrorism it is important to prevent terrorists from acquiring fissile materials, plutonium and highly enriched uranium, to fabricate a primitive nuclear explosive and from acquiring significant quantities of radioisotopes, particularly caesium-137, strontium-90 and cobalt-60, to build a radiological weapon. The protection of these radioactive materials is clearly of the utmost importance. There are literally millions of radioactive sources used worldwide in medicine, industry and agriculture; many of them could be used to fabricate a dirty bomb. They are often not kept securely.

Making existing nuclear-power reactors less vulnerable to terrorist attack is not very feasible although storage ponds for spent fuel elements could be more effectively hardened. And greater care could be taken to vet staff to make it more difficult for a terrorist group to infiltrate people into a nuclear-power station.

The protection of a nuclear facility with, for example, fighter aircraft or surface-to-air missiles is, to say the least, not an easy task. If a terrorist group hijacks a commercial aircraft on a regular flight path that takes it close to, for example, the Sellafield establishment and dives it on to a target in the nuclear facility, the time available to make sure that the aircraft really is attacking the facility and then to scramble fighter aircraft or fire surface-to-air missiles is probably too short to make a successful interception.

The importance of good intelligence

The importance of effective intelligence in countering nuclear terrorism cannot be over estimated. Monitoring the communications of terrorist groups – the activity known as signal intelligence (SIGINT) – has been crucial to this end. Modern terrorists can, however, take steps to protect their communication systems, including, for example, the use of encryption, frustrating the efforts of SIGINT.

The penetration of new terrorist groups by undercover intelligence agents or double agents (human intelligence or HUMINT) is, therefore, of critical importance. In fact, counter-terrorism is likely to succeed only if HUMINT can be made effective. This is why it is, to say the least, not going to be easy to defeat the new terrorists.

Experience shows that setting up effective intelligence activities against terrorist groups is extremely challenging. Rivalries between intelligence agencies within countries and lack of cooperation in intelligence matters between countries seriously reduce the effectiveness of intelligence. Effective and single leadership of national agencies and international cooperation between national agencies are the keys to good counter-terrorism intelligence.

The intelligence and security agencies, in their fight against the new terrorism, face an awesome task that will require the acquisition of any new technological developments relevant to counter-terrorist activities, a close study of new terrorist threats, and, perhaps most importantly, an imaginative approach to the issues.

Dr Frank Barnaby is a nuclear physicist, a former Executive Secretary of the Pugwash Conferences on Science and World Affairs and currently works for the Oxford Research Group.

Further information and references can be found in Dr Barnaby's new book "How to Build a Nuclear Bomb: And Other Weapons of Mass Destruction"(Granta Books, September 2003, ISBN 1862076243)

Nuclear Weapons Awareness Programme

Samia Khan briefly describes a new project aiming to keep nuclear weapons issues in the public eye. SGR has recently lent its support to this initiative.

Representatives of the organisations listed below have been working on a collaborative initiative for several months, based on an original suggestion by Noble Peace Laureate Professor Sir Joseph Rotblat who voiced his concerns that our efforts over the years to convince the British public that nuclear weapons are a dangerous liability, not a national security asset, have been largely unsuccessful.

We agreed that a national, and indeed international, public information/ education programme was necessary to raise awareness of the grave dangers of present nuclear weapons policies, and to shift public perception towards the merits of approaches to global and national security that do not involve nuclear weapons.

Following initial research into the British public's knowledge of and attitudes towards nuclear weapons, the collaboration is developing an extensive public awareness programme for the UK. The programme, that will be underpinned by a well-researched communications strategy, has a number of distinct elements such as a proactive electronic resource, communications with parliamentarians, curriculum development and youth education, and large scale VIP events that will bring together internationally recognised scientists and celebrities/media personalities to highlight the urgency of the issue. Additionally, each collaborating organisation will participate in a way that makes use of its own particular expertise. By pooling our resources in a coordinated manner, the Programme promises to make best use of the capabilities of the concerned organisations.

Although the public awareness work we plan to undertake will of necessity be primarily focussed on the UK public, we believe that the outcomes of the work will impact more widely on the activities of similar organisations in the EU, US and elsewhere. By undertaking a public awareness programme that is founded on solidly-based research, we are hopeful that the results will be particularly effective, and that others will be able to build on this approach.

Samia Khan is Project Worker for the NWAP

Collaborating Organisations in the NWAP

- Abolition 2000
- Atomic Mirror
- BASIC
- British Pugwash Group
- CND
- Greenpeace
- MEDACT
- Movement for the Abolition of War
- Oxford Research Group
- Pax Christi
- Quaker Peace Social Witness UK
- Student/Young Pugwash
- Youth and Student CND
- World Court Project

An End to the UK's Nuclear Weapons

In this article based on his presentation to the SGR conference, John Finney argues that a decision should be made now not to replace the UK's Trident nuclear weapons

Background: does Britain need nuclear weapons?

In 1995, a British Pugwash Group (BPG) report addressed the question of whether Britain actually needs nuclear weapons. According to that study, British nuclear weapons have had no detectable influence on the course of events. They represent less than 2% of the NATO arsenal, they have deterred no enemies, and no serious consideration has ever been given to their use in any war the UK has been involved in. It was never reasonable to think that the UK would use nuclear weapons in circumstances that the US would not. Consequently, the conclusion was that British nuclear weapons could be dispensed with, not because the Cold War was over, but because of their uselessness ever since their introduction.

Nothing has happened since 1995 to alter the basis for the above conclusion. UK nuclear weapons were of no use during the cold war and now they actually have a negative value - i.e. they present us with additional risks in terms of accident possibility and attracting pre-emptive strikes. Their retention is an incentive for others to acquire nuclear weapons.

The UK is legally committed to nuclear disarmament under the terms of the Non Proliferation Treaty, and this was unequivocally confirmed at the NPT review conference in 2000.

Current status of UK nuclear weapons

The UK nuclear weapons programme today is based entirely on Trident. It consists of 4 British-built submarines carrying up to 16 US D5 missiles each with up to 8 British-made warheads. At least one submarine is on patrol at any time. They patrol in a reduced state of alert, with notice to fire periods of days, and missiles not routinely targeted.

The UK has a stockpile of less than 200 warheads, but there has been no explanation of why the UK military chose this number. It may relate to ability to penetrate missile defences around Moscow. Warhead yield is about 100 ktons, with a lower yield option available (1-5 ktons?). We have no information about possible sub-strategic use scenarios.

The Trident system has an operational lifetime of 30 years, and this is determined by the design life of the submarines. The warheads can be maintained indefinitely in service through a programme of inspection, refurbishment and remanufacture at Atomic Weapons Establishment (AWE) Aldermaston. The missiles can be upgraded (a US programme exists). However, unlike the US, the UK has never implemented any life extension programmes for the submarines. *Consequently, a decision to replace the Trident submarines will be needed this decade.*

Prospects for multilateral progress

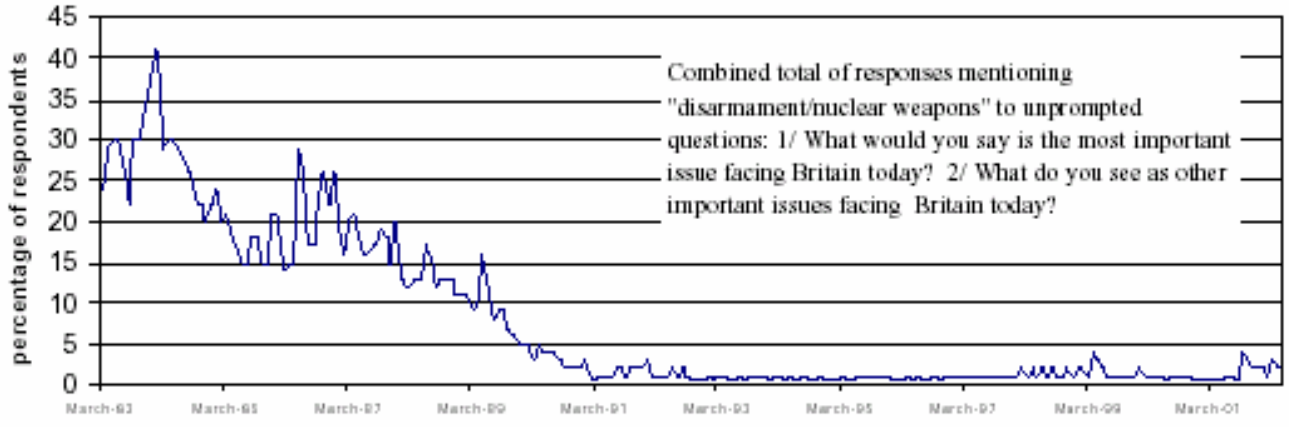
The UK Strategic Defence Review (1998) made it clear that the UK wishes to see mutual, balanced and verifiable reductions in nuclear weapons. A year later, George Robertson set a lead through our policy of minimum deterrence.

The 2000 NPT Review commits states to "accomplish" disarmament but lacks the timescale to give the process any meaning and impetus. There have been setbacks such as proliferation in India and Pakistan (and, arguably, Iran and Korea), US development of "missile defence" and the US Nuclear Posture Review 2002. The latter spells out an intention to maintain large stockpiles and develop new low yield weapons. Furthermore there has been a failure of states to sign or ratify the Comprehensive Test Ban Treaty, and the UN Conference on Disarmament is moribund. All in all, there is little reason at present to expect significant progress towards multilateral disarmament.

Public opinion in the UK

In terms of public opinion the salience of nuclear weapons has all but disappeared over the last 15 years (see figure below). When polled a

Salience of Nuclear Weapons Issues in UK Public Opinion



Source: MORI Public Opinion Newsletter 1983-2002

substantial majority favours Britain retaining nuclear weapons as long as other keep them. However, a 1999 MORI poll showed that two-thirds of Britons would support Blair taking a lead in negotiations to remove nuclear weapons worldwide.

UK policy options

So what policy options exist for the UK to move forward on the nuclear weapons question? The UK could disarm unilaterally *now*. Or it could intensify work towards multilateral disarmament, by pressing for a fissile material cut-off treaty, promoting No First Use as NATO policy, or by encouraging moves towards global fissile material protection, control and accounting. Redirection of AWE and BNFL resources could contribute to the latter. Unilaterally, the UK could reduce warhead numbers and clarify the rationale behind the number retained, or adopt a No First Use national policy.

On the other hand, the UK could decide *now* not the replace Trident when its design life expires in 2020. This would establish a timetable to meet our obligation under the NPT and galvanise the UK to throw its full weight behind multilateral disarmament. It would also be a relevant argument against the perceived need for smaller states to join the nuclear club.

Supporting actions could include reducing the military Plutonium stockpile, announcing that no more tritium will be produced or procured after the Chapelcross nuclear facility closes in 2005, and fundamentally reassessing the role of AWE, ending warhead design and production. Work at Aldermaston could be redirected, expanding current work on verification and other aspects of arms control. It could contribute to initiatives aimed at enhancing the security of nuclear materials in Russia. Conversion of Aldermaston to a fully defensive role could have a positive impact comparable to the 1956 decision to halt development of chemical and biological weapons at Porton Down. Another possibility could be civil redeployment of the AWE facilities in areas such as high energy physics, lasers, materials sciences etc. Finally, there is the option of simply closing AWE Aldermaston.

Conclusions

The UK government should decide and announce that the UK will not acquire a replacement for Trident when its operational life expires about 20 years from now.

In addition, the UK government should:

- justify the number of warheads deployed
- clarify the circumstances in which they would be used
- announce that no further military tritium will be produced or purchased after 2005
- reduce the UK military plutonium stockpile to the minimum needed to see out Trident, with the surplus being placed under international safeguards
- AWE should no longer retain a warhead design and development facility
- AWE work should be redirected towards certification, nuclear arms control, non-proliferation and disarmament work
- Consider realigning stewardship-related science towards civil research.

John Finney is Professor of Physics at University College London and Treasurer of the British Pugwash Group.

This article was prepared from Prof. Finney's slides by Patrick Nicholson, SGR newsletter editor.

For further information see the British Pugwash Group report "An end to the UK's nuclear weapons" published in 2002 and downloadable from <http://www.pugwash.org/uk/documents/end-to-uk-nuclear-weapons.pdf>.

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New SGR Envelope Re-Use Labels

We are pleased to announce that we have a new version of the SGR envelope re-use label (illustrated on the enclosed recruitment leaflet). These are available to members at a special price of £3 per hundred (£4 per hundred to non-members) plus p&p at the usual rates* so why not order a pack (or even two) and help publicise SGR whilst re-cycling all those old envelopes!

* Please allow for postage and packing as follows:

- for orders up to £15 please add 20% (25% if ordering from outside the UK)

-for orders over £15, please add 10% (15% if ordering from outside the UK).

Cheques should made payable to "Scientists for Global Responsibility" and sent with your order to the SGR office address (see back page).

Stormy Times for Climate Research

Clare Goodess explains the circumstances behind the resignation of half of the editorial board of the journal Climate Research

How can the publication of one poor paper in a scientific journal have caused the resignation of half the members of its editorial board (including the newly-appointed editor-in-chief) and have these resignations had any effect? As one of the editors who resigned from Climate Research at the end of July 2003, these are some of the questions that I am left pondering.

The article in question (Soon and Baliunas, 2003) was published at the end of January 2003. It is in fact a literature review of over 240 previously published studies of climate proxy records (such as tree rings, glaciers and ocean sediments) covering the last 1000 years. It contains some startling and controversial conclusions, notably: "Across the world, many records reveal that the 20th century is probably not the warmest or a uniquely extreme climatic period of the last millennium' and 'Overall, the 20th century does not contain the warmest anomaly of the past millennium in most of the proxy records which have been sampled world-wide."

With conclusions like these, it is not surprising that this paper (and a remarkably similar version published in Energy and Environment (Soon et al., 2003) attracted the attention of the White House administration. At least one press release from the authors deliberately fuelled this politisation of the paper and its conclusions. Internal documents from the US Environmental Protection Agency (EPA), now in the public domain, show that the Bush administration attempted to get this paper cited in an agency report on the state of the environment. EPA staff members blocked this by deleting all mention of climate change from the report. This did not stop the anti-Kyoto lobby, however, and the Republican Senator James Inofhe from Oklahoma called a hearing of the Senate environment committee in late July to debate the paper.

In the meantime, Hans von Storch (another Climate Research editor) and myself had been receiving numerous unsolicited complaints and critiques of the paper from many leading members of the international palaeo and historical climatology community. At the beginning of May 2003, these had reached such a level that we raised the concerns with the editor who had processed the Soon and Baliunas paper (Chris de Freitas) and the publisher (Otto Kinne of Inter-Research). In response, de Freitas accused us of 'a mix of a witch-hunt and the Spanish Inquisition'. The publisher eventually asked to see the documentation associated with the review of the paper - which had apparently gone to four reviewers none of whom had recommended rejection. Otto Kinne concluded that the review process had been properly conducted.

This left many of us somewhat confused and still very concerned about what had happened. The review process had apparently been correct, but a fundamentally flawed paper had been published. These flaws are described in an extended rebuttal to both Soon and Baliunas (2003) and Soon et al. (2003) published by Mike Mann and 11 other eminent climate scientists in July (Mann et al., 2003). Hans von Storch and I were also aware of three earlier Climate Research papers about which people had raised concerns over the review process. In all these cases, de Freitas had had editorial responsibility.

My main objective in raising the concerns of myself and many others over the most recent paper was to try to protect the reputation of the journal by focusing on the scientific rather than the political issues. Though I was well aware of the deliberate political use being made of the paper by Soon and Baliunas (well-known 'climate sceptics') and others. Chris de Freitas has also published what can be regarded as 'climate sceptic' views.

Eventually, however, Inter-Research recognised that something needed to be done and appointed Hans von Storch as editor-in-chief with effect from 1 August 2003. This would have marked a change from the existing system, where each of the 10 editors works independently. Authors can submit a manuscript to which ever of these editors they like. Hans drafted an editorial to appear in the next edition of Climate Research and circulated it to all the other editors for comment. However, Otto Kinne then decided that Hans could not publish the editorial without the agreement of all of the editors. Since at least one of the editors thought there was nothing wrong with the Soon and Baliunas paper, such an agreement was clearly never going to be obtained. In view of this, and the intervention of the publisher in editorial matters, Hans understandably felt that he could not take up the Editor-in-Chief position and resigned four days before he was due to start his new position. I also resigned as soon as I heard what had happened. This turned out to be the day of Inofhe's US senate committee hearing and the news of the two resignations was announced at the hearing . Since then, another three editors have resigned.

So Climate Research (CR) has lost half of its editors and the five remaining include Chris de Freitas. The latest twist in this story is an

editorial by Otto Kinne in August's edition of the journal (Kinne, 2003) which cites the two conclusions of Soon and Baliunas quoted earlier in this article and then states that "While these statements may be true, the critics point out that they cannot be concluded convincingly from the evidence provided in the paper. CR should have requested appropriate revisions of the manuscript prior to publication.'.

I will be watching Climate Research with interest over the coming months to see whether there are any changes in editorial practice and/or in the editorial appointments. Otto Kinne has published fairly extensively on the nature and quality of the science review process – though from a rather theoretical perspective. My experience over the last few months has been that practice does not always meet theory.

The last few months have also taught me quite a lot at first hand about the highly sensitive and political nature of the climate-change debate in the US. Though I have been quite impressed with some of the media coverage of the whole affair. I had fairly lengthy interviews with reporters from the Wall Street Journal and The Chronicle of Higher Education amongst others. The latter article in particular gives a very balanced and well-researched account of events.

Some journalists are digging even deeper – into the sources of Soon and Baliunas's funding. Their Climate Research paper includes acknowledgements to NOAA, NASA and the US Air Force, as well as to the American Petroleum Institute. Yet NOAA flatly deny having ever funded the authors for such work, while the other two bodies admit to funding them, but for work on solar variability – not proxy climate records, the topic that has caused such a storm.

Clare Goodess is a Senior Research Associate in the Climatic Research Unit, University of East Anglia, where she has worked since 1982.

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The Sociobiology of Vaccination

Peter Nicholls explores public and personal responsibility in acceptance or rejection of the MMR vaccine

For over 200 years it has been generally accepted that vaccination (1) protects the individual against smallpox in the community. Yet public acceptance of smallpox vaccination, especially for children, was quite slow in coming, even against that hideous and dangerous disease. Why? The antivaccination league was one of the strongest social movements in late Victorian England, with many resisters fined or even imprisoned for refusing vaccination for their children (2). It recruited some famous supporters, most notably George Bernard Shaw (3) and most significantly Alfred Russel Wallace (4).

Wallace's arguments were based upon: (i) ideas about the organisation of the living world (a "use for microbes in the scheme of life"); (ii) statistics (emphasising overall trends rather than differences between vaccinated and unvaccinated - with legal compulsion it paid the infected to claim vaccination, and conversely, with reputation to consider, it paid doctors to deny it); (iii) medicine (generalised vaccinia); (iv) evolution (niche replacement between microorganisms); (v) politics (the State thereby escapes responsibility for public hygiene); and (vi) freedom of choice (no compulsion in medical treatment).

Wallace showed that communities embracing vaccination programmes were statistically often more susceptible to smallpox attacks than those who took alternative prophylactic measures. Eventually, after a series of Royal Commissions (5), to which he contributed (6), compulsion was abolished. My parents, followers of Shaw, refused me smallpox vaccination as a child.

Today combined vaccination of children against mumps, measles and rubella (MMR) is analogously criticised. Wakefield's strongly opposed claims (7) for a link between MMR vaccination and autism and bowel syndromes include both medical (pathological, individual) and epidemiological (global, societal) arguments; his use of statistics in emphasising public trends rather than individual risks echoes Wallace. Several web sites (cf. 8) offer advice that counters the bland official denials. Governmental responses (cf. 9) raise the question of freedom of choice again, as did 19th. century vaccination acts. Are other diseases on the increase: asthma, autism and allergies? Are they, as Wallace would have argued, examples of niche replacement? And if so, are they linked to vaccination programmes?

Risk and benefit must always be a matter of personal calculation. Measles is an unpleasant disease but not in the same league as smallpox. The Figure shows the decline in measles in the first three-quarters of the 20th. century in the USA. The use of this figure (in earlier linear versions) by an independent web site (8) querying the official position on MMR, is strikingly reminiscent of Wallace's use of global statistics. Some conclusions are clear - an early 20th. century biennial oscillation of

measles outbreaks already died down by the 1960's, before general vaccination started. More strikingly, measles mortality, serious in the early 20th. century, declined steeply prior to such programmes and is unaffected by them. Vaccination had its greatest effect in diminishing occurrence of the disease to almost zero after it had already fallen to very low levels.

Calculation of risk - of disease and of medicine (iatrogenic) - is not easy. It will differ between common and uncommon diseases; between lethal and non-lethal diseases; between general (infectious) and local (contagious) diseases; and between diseases threatening everyone and those threatening only a specific subgroup. One of the mistakes that may have been made in combining the three vaccines was the inclusion of anti-rubella as part of the package. Previously given only to girls and women of child-bearing age, the disease is really only a threat to a foetus and not to children or adults. A sink of rubella therefore remained amongst boys; they are being asked to accept immunisation against something that does not threaten them but another social group.

We, selfishly, make calculations of benefits for ourselves. Parents, more altruistically, make such calculations for their children. MMR vaccine is a benefit to society although even here the possibility of partial immune protection encouraging appearance of resistant pathogen strains is a matter for the authorities as well as the individual (10). MMR and other vaccines are also of benefit to the medical sector of society, directly in the case of pharmaceutical companies, indirectly in the case of medical professionals. But the benefit(s) to the actual or prospective vaccinee are less clear.

Vaccination against smallpox (11) was certainly not risk free. MMR vaccination possibly involves some risk. The most advantageous personal strategy, and *a fortiori* the strategy to adopt in protecting one's offspring, is therefore to try to remain unvaccinated amidst a vaccinated herd - the 'defector' strategy of game theoreticians, cf. (11). The advantage depends upon the several risks as well as the strategy followed by the herd itself. In the UK the take-up of the MMR vaccine by parents hovers at the 85-90% level, too low, say epidemiologists, to control the spread of the diseases but interestingly somewhere near the Nash equilibrium strategies for the system with reasonable values for the payoffs.

Reluctance to allow medical treatment of one's children, however slight the evidence for danger, is undoubtedly linked unconsciously to other strategies involving social cooperation and defection in our evolutionary past. There are inevitable tensions between morality, politics and biology in assessing risk informally and socially, as well as formally and technically. The official world, alas, never seems to understand this.

Peter Nicholls, is at the Department of Biological Sciences, University of Essex.

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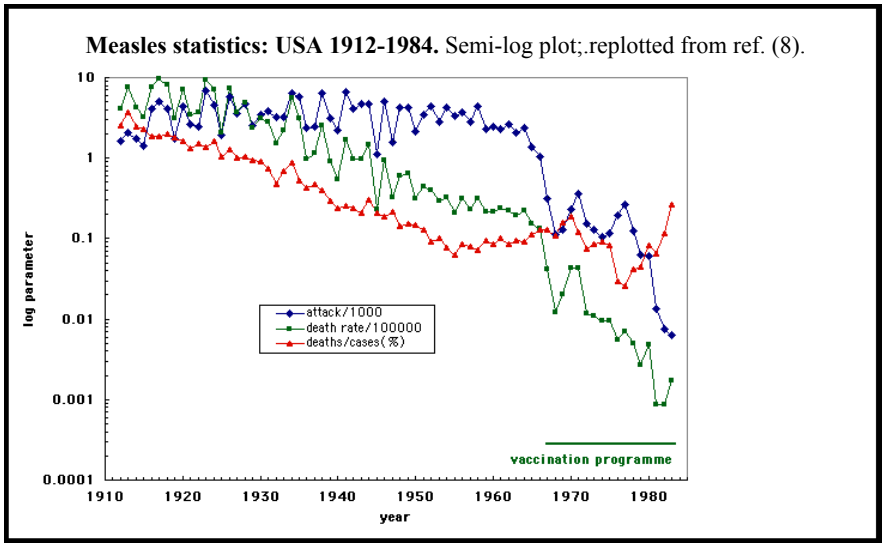

Measles statistics: USA 1912-1984. Semi-log plot;.replotted from ref. (8).

Conference Reviews

Nuclear Weapons: Issues for UK Policy

Scientists for Global Responsibility Conference and AGM.

Friends House, London, 13 September 2003.

Stuart Parkinson, Director of SGR, opened the conference with a few words on the relevance of the conference theme in the context of ongoing world events.

Frank Barnaby on nuclear terrorism

Frank Barnaby then spoke on the Risk of Nuclear Terrorism. Dr Barnaby is a nuclear physicist, a former Executive Secretary of the Pugwash Conferences and currently works for the Oxford Research Group. The full text of his talk appears elsewhere in this newsletter (see p1), so will only be very briefly summarised here.

Dr Barnaby outlined reasons for supposing that terrorists may try to develop nuclear, as opposed to biological and chemical, attacks. He described a range of possible scenarios for terrorist use of nuclear and radiological weapons. Finally Dr Barnaby discussed steps that could be taken to counter nuclear terrorism, concluding that effective intelligence was of the greatest importance. His belief, however, was that terrorism was impossible to prevent if the terrorists were determined enough, and that society should be prepared to absorb attacks.

Questions from the floor followed, and included several contributions on the topic of the risks in the UK's export of mixed oxide (MOX) fuel given its potential as a "dirty bomb" or as a source of plutonium for nuclear weapons. Export of MOX contradicts stated government policy to reduce risks from nuclear terrorism, and could be an important issue for SGR to take up.

Whilst plutonium and enriched uranium stockpiles are relatively secure in the UK, this is not the case in the former Soviet Union. There may therefore be arguments for using up this stockpiled Russian fissile material in MOX fuel.

In response to a question about small nuclear weapons, Dr Barnaby pointed out that these have long existed (e.g. nuclear artillery) but the new weapons offer greater accuracy and penetration.

Concerns were voiced about colluding in generating an atmosphere of public fear rather than addressing the root causes of terrorism. We should become more sophisticated about the politics of the imagination. One contributor thought that making a nuclear weapon involved a great deal of tacit knowledge that would be beyond a terrorist's grasp. Dr Barnaby countered that, based on his experience, creating a *primitive* implosion-based nuclear weapon would not be difficult. He pointed out that SGR was founded on ideas of openness, and his attitude was to be honest about the facts.

John Finney on the UK's nuclear weapons

John Finney, Professor of Physics at UCL and Treasurer of the British Pugwash Group (BPG), gave a talk entitled "An End to the UK's Nuclear Weapons" based on the report of the same name published by the BPG in 2002. Again the talk is the subject of an article elsewhere in the newsletter (p11), and will not be described in details here. In essence, Prof. Finney argued that the government should decide now not to replace Trident when its design life expires in 2020. This would be a useful and realistic step forward. He also suggested a number of additional steps the government should take including justifying warhead numbers, reducing military plutonium stockpiles, redirecting Atomic Weapons Establishment (AWE) Aldermaston towards arms control and verification work, and working towards a multilateral "no first use" agreement.

Questions were then taken by both Dr Barnaby and Prof. Finney. The close relationship between the UK and the USA was brought up, and the fact that UK nuclear weapons to some extent "shore up" US weapons, whilst the UK is technically dependent on the US for its nuclear deterrent. Another facet to this relationship is that the US is probably the only state capable of posing a real threat to UK Trident submarines on patrol.

There were concerns on the relevance of focussing on Trident when nuclear capable cruise missiles can be fired from just about any vessel. The government could ditch Trident but introduce new systems, possibly dual use systems such as long range missiles. Prof. Finney reiterated that we should still consider what concrete steps can be taken now here in the UK. In the context of the Non Proliferation Treaty, he felt that the decision not to replace Trident was the way to go.

Other points discussed included worries about the non-proliferation issue being moved from an arms-control and verification agenda towards a neo-conservative agenda of military intervention and how SGR could best contribute to progress towards nuclear disarmament.

Another further comment was that the International Atomic Energy Agency reports to the Security Council on proliferating states but not on states failing to honour their commitment to disarm under article VI of the NPT. It was suggested that we also need to focus on the Comprehensive Test Ban Treaty, a key arena in terms of redirecting scientific work, as well as looking at the NPT. Prof. Finney stated again that the focus of his talk was the NPT.

Following a short break, the SGR AGM took place (see p3). After the AGM the conference was brought to a close by Stuart Parkinson who thanked the all the speakers and participants for their contributions.

Patrick Nicholson

Book Reviews

Regime Unchanged: why the war on Iraq changed nothing

Milan Rai

Pluto, 2003, 256pp, £10.99, ISBN 0 7453 2199 2

Here is a near-instant book which I think is nevertheless, in the few months since publication, well on its way to being vindicated by history.

The book's radical scepticism about every aspect of the US-UK war propaganda continually becomes more orthodox. The case is set out in detail, with over 1000 references and notes.

Just one section did puzzle me. A chapter called The Censored Document refers to the Draft Work Programme, submitted by Hans Blix, head of the UN Monitoring Verification and Inspection Commission (UNMOVIC) to the UN Security Council on 17 March 2003. This document sets out the key unresolved disarmament issues and lists those tasks that would have to be achieved for Iraq to be declared disarmed. Rai argues that the DWP was "potentially pivotal" and the submission "an event that could have changed the course of history". Wow, this is important, let's see the basis for this assessment. Oddly, despite the generally detailed referencing, there is no reference - that I could find - which serves as source for this claim. Milan goes on to refer to "this explosive yet virtually unknown document". Now, if it is only *virtually* unknown, surely we deserve a reference so that we, if we are assiduous, can decide for ourselves how explosive this document really is. I did check the web and within seconds found about 150 hits which were exactly relevant. The results are instructive. The DWP document itself is easily available in full from numerous UN pages. There is a lot of commentary but it is wholly - as far as I could see from a fairly quick perusal - from anti-war NGO sites. I found no pages at all from any mass media that referred to the document having been submitted or, as indeed it was, sidelined by the US. There were quite a few mass media hits but only from around 7 March reporting that Blix was ready to submit the DWP document.

Milan Rai predicts that the document "will be effectively erased from history, and relegated to the peripheral realm of footnotes and obscure specialist studies." In a later section, pages 119 - 20, Milan, concurring with ideas of Orwell and Chomsky, discusses how effective can be the burying of accurate information under a mass of misrepresentation. I think that a good example of this kind of erasure is the public perception of the reasons why the US dropped atomic bombs on Hiroshima and Nagasaki. Such distortion in the case of the 2003 war on Iraq is, in my opinion, much less likely to succeed and indeed is already being exposed widely, partly indeed due to Milan Rai's own writings.

And in his Introduction, Milan does express qualified optimism about the global anti-war movement, pointing out, for example, that it "helped to lay the basis for a stronger movement better able to prevent the next war." I consider this book to be part of that basis and I hope that many people will use it. I am going to register my copy with www.BookCrossing.com and give it to a friend. I hope to find, a few years hence, that it has become a well-travelled peace activist.

Alan Cottey

DSEi 2003: International Arms Market

Campaign Against the Arms Trade (CAAT), 2003, 44pp, ISBN 0 9543329 3 8

£3 postage inc. from CAAT 11 Goodwin St. London N4 3HQ or downloadable (free) from <www.caat.org.uk>

This booklet, a product of communal research and hence authorship from CAAT, should be a reference item on all peacenik bookshelves. It is however unpleasant to read, not because it is poorly written, it is not; but the subject matter requires a strong stomach. It describes the countries and companies involved in the arms trade, as exemplified by the recent arms fair in East London. As well as the usual information, presented clearly and quantitatively, there are nuggets new to this reviewer, e.g. the two levels of invitees, the "gold" list invited by the UK government (MOD), and the "silver" list invited by the private fair organisers, appropriately named Spearhead. Israel, Croatia and the Ukraine, not invited by the MOD, were on the private list. A select few, such as Indonesia, have dropped off both lists. But most Middle Eastern and African countries are happily included. Tony Blair, like previous PMs, goes from country to country trying to sell British weapons. He does it, he says, to support British manufacturing; attempts to sell spectrophotometers are rarer, despite the fact that medical equipment may be a bigger potential market than arms. But the latter has one advantage; it is about power. Cluster bombs are just symbols. Look at these lists; sense the mountain we have to climb.

Peter Nicholls

The South African Deal: A Case Study in the Arms Trade.

Campaign Against the Arms Trade, June 2003, 28pp, ISBN 0 9543329 3 8 (other details as above)

South Africa achieved democracy in a bloodless revolution, which delighted but surprised many of us who had followed that country's politics during the apartheid era. What we did not fully recognise were the costs of that success, the internal trade-offs needed to avoid violence. The old South Africa had a large internal arms industry because of the embargo and the very real threat of military action.

It also had a substantial armed forces and defence complex. In the twilight of the *ancien regime* that industry and complex were allowed to run down. So the new South Africa, sensitive to its national and international image, decided to restore some military capability. But this went beyond the small arms and personnel carriers that might legitimately be needed in peace-keeping operations elsewhere in Africa; it included frigates, submarines and fighter aircraft. At a time when South Africa no longer need fear outside intervention, and with the embargo long past, they proceeded to buy such weapons despite the competing social needs of the internal society. The "book" costs, of course, are kept low. How? By loans from first world banks and agencies, and by "offsets", the mechanism whereby a nation's purchases are balanced by the seller's commitment to arrange purchase of goods from the buyer or to invest in the buyer's domestic economy. Along with loans and offsets come bribes (aka "commissions"). *Descensus in averno*. The shopping list, by first world military standards, was modest. But the consequences go rippling on. A recent BBC news broadcast discussed some of the problems of possible corruption, influence and incompetence outlined in this booklet by Christopher Wrigley of the CAAT staff. It is complete and detailed. Read it. One of us may at some future time be defence minister in a country that has undergone a democratic revolution. Subsequent pressures will be enormous. See how they might be/have not been resisted.

Peter Nicholls

Why Should I be Concerned About Human Genetics?

Human Genetics Alert, 2003, 12pp.

HGA, Unit 112, Aberdeen House, 22-24 Highbury Grove, London N5 2EA. Available to download from <http://www.hgalert.org/briefings/briefing1.pdf>

Human Genetics Alert (HGA) is an independent public interest watchdog group formed in 1999 and based in London. The group is funded mainly by charity and is committed to informing people about human genetics issues and to putting forward clear policies that serve the public interest. This briefing is one of two published HGA, the other being their campaign briefing "The Case Against Sex Selection" (also available at <http://www.joebutton.co.uk/hgmail/briefing.html>).

This briefing examines some of the key issues raised by human genetics, and outlines HGA's responses to those issues. The first section considers the possible benefits that have been promised by human genetics research, and then considers the degree to which these benefits have been, or are likely to be realized. It draws attention to the dangers of over-emphasising the genetic causes of disease and the need to balance research between the genetic and the social and environmental causes of disease. The briefing then considers seven specific topics:

1) The ethics of medical genetic testing

2) Privacy and genetic discrimination

3) Prenatal screening and disability rights

4) Psychiatric and behavioural genetics

5) Cloning and stem cell research

6) Gene therapy and human genetic engineering

7) Commerce, research and patents.

The ethical issues of each of these topics is raised and HGA makes recommendations for appropriate regulations and policy that should be adopted. These recommendations are based on five main principles that the HGA adopts:

1) Genetic research should be driven by genuine need, not commercial imperatives or social and cultural prejudices

2) Genetic technologies must not exacerbate existing social inequalities, or create new ones

3) Social problems should not be subjected to 'genetic fixes'

4) People must not be seen simply as determined by their genes

5) The public must be able to democratically control human genetics.

The briefing is informative, clear, and well argued. It is a useful starting point for those with general concerns about the uses of human genetics, and a good survey of the field for those with more specialized concerns.

The HGA webpage is not all it pretends to be - there are links to "Daily news" a "Newsletter" and "Press releases" which have had no new entries since 2002. However the link to "Topics" takes you to a rich source of the research and thinking behind the issues and recommendations in the above briefing. Where those concerned about the responsible use of human genetics can probably gain the most from HGA is through subscribing to one of their free email news bulletins on human genetics issues. One is published daily and the other is weekly, either can be subscribed to via the "What's new?" link on their webpage.

Richard Jennings

Don't Worry (It's Safe to Eat): The True Story of GM Food, BSE and Foot and Mouth

Andrew Rowell

Earthscan, July 2003, 280pp, £16.99, ISBN 1 85383 932 9

A devastating indictment of government policy on agriculture and science, this book deserves to be read by every thinking member of the public and by scientists in particular. Exposing first the shameful history of the BSE crisis in Britain, then proceeding to the equally shaming development of the Foot-and Mouth epidemic, the author guides us to the prospect of another unnecessary and tragically costly debacle in the form of genetically modified plants and animals. He closes with an enumeration of wide-ranging and rigorous reforms needed to provide a safe and sustainable food supply and to re-mould science policies for the good of people and the environment.

The story of BSE ran as follows. It became apparent that animals were becoming ill, but the government of the day reassured the public that the situation was not serious, to avoid financial harm to the meat industry. Amenable, non-expert scientists were selected to investigate the matter. These scientists confirmed what the government had told the public. Unbiased, expert scientists brought forth evidence to the contrary but were belittled, harassed and, in some cases, dismissed from their posts. The crisis continued and gained strength, with the loss of lives of huge numbers of animals and many human beings. The disease was at last brought under control after some years, but not eradicated.

The tragedy of this BSE history is that the consequences could have been tremendously reduced, if only the advice of those who warned had been accepted. It was not heeded because the government put the financial interests of the meat industry before concerns for the health of the population. In the end, the crisis cost the nation millions of animal lives and billions of pounds.

The story of F&M disease is alarmingly similar. Millions of animals, many of them healthy, were slaughtered. Some were prized stocks that had taken generations to breed, but they were destroyed because animals on another farm in the vicinity had contracted the disease. Again, expert scientists pleaded for a change of policy that could have brought the crisis to an early end; but commercial interests prevailed and the disease progressed throughout the land. Once again, the experts were vilified, millions of animals were slaughtered and billions of pounds were wasted.

With genetic modification, we have had (and continue to have) reassurances about safety for human health and the environment, from advisory scientific committees weighted with scientists who benefit financially from GM. We have had the vilification and dismissal of expert, unbiased scientists, notably Dr Arpad Pusztai. If the commercial growing of GM crops in Britain is approved, we must expect unhappy, predictable consequences in the short term and, undoubtedly, unforeseen and possibly terrible consequences in the long term. Much evidence to cause serious concern already exists; but the government chooses to ignore it.

Various advisory committees and regulating bodies, and the influential Royal Society, are exposed for their leanings towards industry and their support for government views. They, too, are culpable in the disasters we have experienced, by failing in their duty to provide or heed unbiased assessments of scientific evidence.

Perhaps the most chilling message of this book is that successive governments follow the same pattern of false reassurance and obfuscation in all crises, learning nothing from one episode to the next. In their desperate efforts to protect the financial interests of industry, they fail to perceive that their primary objective should be to protect the health of the population, of farm animals and of the environment. Despite the examples of the past, and despite the good common-sense of the British people in their recent overwhelming rejection of genetically modified crops, it appears very likely that the current government will push for having these crops grown here. GM is set to be the next agricultural crisis in the United Kingdom.

The closing chapter elaborates on the present crisis-in-the-making, genetic modification, and also provides a blueprint for an urgently needed, total overhaul of decision-making and funding for agriculture, science and technology.

The final words should go to the author:

'Science has become a battle between precaution and exploitation.'

'If public science is being driven by private greed, people will never trust it.'

'If we have learned anything from BSE and foot and mouth, it is that the precautionary principle needs to be the overriding factor that guides science, not commercialization.'

Eva Novotny

Towards a GM free Europe

The Greens / European Free Alliance, July 2003, 4pp.

Downloadable from <http://www.carolinelucasmep.org.uk>.

This leaflet produced by Caroline Lucas MEP and the Greens/European Free Alliance (EFA) in the European Parliament explains briefly the threats posed by GM crops and food, then describes the approval process for GM food in the European Union. Legal issues addressed are traceability, labelling, liability and the collision between the EU and the United States over the EU moratorium on GM crops, with the US now taking its complaint to the World Trade Organisation. The threat of widespread contamination of non-GM crops is also described. The leaflet is a useful summary of the background and current status of GM crops in Europe.

Eva Novotny

GM Crops and the Developing World

UK Food Group, July 2003, 2pp.

Downloadable from <http://www.ukfg.org.uk>.

This leaflet is a two-page briefing on 'GM Crops and the Developing World', produced by the UK Food Group. This argues that GM crops are not necessary to eradicate hunger and lists concerns about GM crops. The leaflet also points to the issues that would genuinely contribute to the ending of hunger and poverty.

Eva Novotny

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Events

Every Saturday

Vigil Calling for the Release of Mordechai Vanunu

Noon - 2.00 p.m., outside Israeli Embassy in London (jn. of Kensington High St and Kensington Court). Organised by the Campaign to Free Vanunu and for a Nuclear Free Middle East.

Tel: 020 7378 9324
Email: campaign@vanunu.freeserve.co.uk
Website: www.vanunu.freeserve.co.uk

3 December 2003

Contaminated without Consent

Rachel Carson Memorial Lecture given by Sandra Steingraber at the Prince's Foundation, 19-20 Charlotte Rd, London EC2A 3SG, 6.30pm for cocktails, £25. Organised by Pesticide Action Network UK.

Tel: 020 7274 8895
Email: katebootle@pan-uk.org

5 December 2003

Strategic Nonviolence in an Age of Terror

Public lecture by Michael Randle (Dept. of Peace Studies, Brighton) at the Centre for Human Ecology, 12 Roseneath Place, Edinburgh EH9 1JB, 18:00-19:30.

Tel: 0131 624 1972
Email: info@che.ac.uk

5 – 6 December 2003

Working for a peaceful future: Resisting the never-ending "War on Terrorism"

Network for Peace Conference at Friends House in London.

Tel: 020 7278 3267
Email: nfp@gn.apc.org
Website: www.networkforpeace.org.uk

16 January 2004

Corporate Accountability and Environmental Justice

Public lecture by Duncan McClaren (Chief Executive, Friends of the Earth Scotland) at the Centre for Human Ecology (address and contact details above), 18:00-19:30.

If you are attending any of these events, don't forget to take along a few SGR leaflets etc.

This edition of the Newsletter was edited by Patrick Nicholson. The opinions expressed within do not necessarily represent those of SGR.

Please send contributions for the newsletter to *<newsletter@sgr.org.uk>* or the SGR postal address.