The Militarisation of Science and Technology

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Scientists for Global Responsibility
Scientists · Architects · Engineers · Technologists

SGR
Promoting ethical science, design and technology

http://www.sgr.org.uk/

Presentation at 'Resisting Militarist Britain' conference, Resources for London, 4 June 2016

Scientists for Global Responsibility research

- ‘Soldiers in the Laboratory’ (2005)
  - Detailed report on military sci/tech, especially in UK (and links to US), incl. funding, lobbying, ethical & political issues
- ‘Scientists or Soldiers?’ (2006)
  - Ethical issues and potential for alternative careers
- ‘More Soldiers in the Laboratory’ (2007)
  - Assessed new UK government/ industry military programmes
- ‘Behind Closed Doors’ (2008)
  - Examined growing military involvement in UK university sector
- ‘Science and the Corporate Agenda’ (2009)
  - In-depth report including chapters on military corporate sector and fossil fuel industry
- ‘Offensive Insecurity’ (2013)
  - Detailed new data on UK R&D military and that tackling the roots of conflict, incl. assessment of shifts in national security policy

Other SGR activities include education work – including presentations to academics, peace campaigners, and students; articles in specialists media etc – and advocacy work with SGR members and other campaign groups on issues related to military involvement in R&D

References: SGR (2005; 2006; 2007; 2008; 2009; 2013)

UK as an example

- 'Upper-middle ranking' military nation
  - Between highly militarised nations and average industrialised nations
- 5th largest military spender in world
- One of 5 'recognised' nuclear weapons nations
- Recent/ current involvement in large wars
- Major arms exporter
  - e.g. Saudi Arabia, UAE, China

• In 2015, UK military spending was $56bn: 2.0% of GDP (SIPRI, 2016)

• Highly militarised nations include USA and Russia. In 2015, US military spending was $596bn (3.3% GDP) and Russia's was $66bn (5.4% GDP) (SIPRI, 2016)

• Average industrialised nations – military spending around 1.4% GDP, limited/ no involvement in recent wars (Oxford Research Group, 2015)

• Arms exports data from: Campaign Against Arms Trade (2016a)

UK military science and technology: key factors

UK military equipment spending

- £178bn over next ten years
  - Additional £12bn in 2015 Defence Review
- Major programmes
  - Submarines & nuclear weapons (1/4 of budget)
  - Warships
  - Combat planes
  - Armoured fighting vehicles
  - Long-range support aircraft
  - Weapons

• Submarines & nuclear weapons - incl. Trident replacement (4 x nuclear-armed subs – total cost risen to £31bn); completion of 7 x Astute Class conventionally-armed subs – approx ¼ of total equipment budget
• Warships – incl. completion of 2 x Queen Elizabeth Class aircraft carriers; Type-26 Global Combat Ship
• Combat planes - incl. F-35 Lightning II fighter-bombers (accelerated introduction); Typhoon fast jets (lifetime extension); more armed drones
• Armoured fighting vehicles - incl. Warrior, Scout
• Long-range support aircraft - incl. Voyager & A400M for heavy lift, air-to-air refuelling; 9 new marine patrol aircraft
• Weapons - incl. missiles, torpedoes and bombs
• Helicopters - incl. Chinook, Apache, Puma and Wildcat
• More details in HM Government (2015)

Engineering and science essential

- Government military/ defence strategy based on:
  - High technology, especially 'networked' technologies
  - Prominent role for 'offensive' weapons systems
    - Capability for 'force projection' over long-range
- Major role of military corporations
  - Often monopoly suppliers
- Involvement of scientists/ engineers essential
  - Large budgets for Research and Development

SGR (2013)

Ministry of Defence Research & Development

- Recent R&D spending: £1.5 bn per year
  - Approx 1/6 of UK Gov R&D spending
  - One of the world's largest funders of military R&D
- Main research arm is Defence Science and Technology Laboratory (DSTL)

• Average spending figures for 2012 and 2013 (latest) from: Office of National Statistics (2015)

UK Military R&D: Top 4 areas

		Public R&D spending 2008-11
1.	Nuclear weapons systems *Warheads; 'Successor' submarines; Nuclear propulsion for submarines*	£980m
2.	Strike planes *Typhoon, F-35 Lightning II, Tornado*	£771m
3.	Attack helicopters *Mainly Future Lynx/ Wildcat*	£599m
4.	Unmanned aerial vehicles *'Drones', including Mantis, Taranis*	£195m

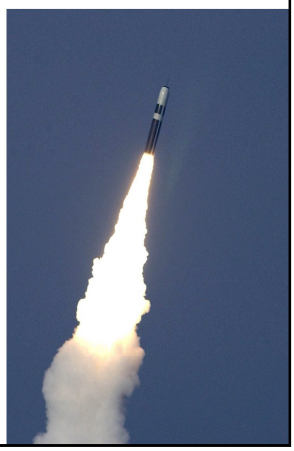
SGR (2013; 2014)

- All have major role in 'force projection', i.e. offensive
- These are minimum figures due to incomplete Ministry of Defence data

- Other areas of interest include missile systems, communications systems, warships, cyber-security, body armour, chemical/biological/radiological/nuclear defence, emerging technologies etc
- These are minimum figures – 1/4 of MoD R&D spending not clearly documented at programme level
- In public relations, the 'life-saving' contribution of military R&D projects is often emphasised, e.g. soldier armour, although in practice this is a small proportion.

UK nuclear warhead R&D

- Atomic Weapons Establishment (AWE), Aldermaston
- Major expansion, involving new research facilities
  - Supercomputers; Orion Laser etc
- Collaboration with USA and France
  - Joint research centre with France
- Concern that these undermine nuclear weapons treaties
- R&D spending £100m per year
  - from total budget of £1 bn+



New facilities installed in recent years – details:
• Supercomputers (Blue Oak, Larch etc) – simulation of nuclear explosion
• Orion Laser – small-scale simulation of nuclear detonation, e.g. fusion and boosting
• Materials testing laboratory – to study behaviour of nuclear weapons components
New joint research centres with France – as part of 2010 Teutates agreement
• Joint radiographic/ hydrodynamics facilities – Teutates EPURE at Valduc, France, and Teutates Technological Development Centre at AWE, UK
• Claimed not to be connected to development of new nuclear warheads, but major doubts remain, especially regarding whether they undermine the Nuclear Non-proliferation Treaty and Comprehensive Test Ban Treaty.

Sources:
AWE annual reports and other related documents. http://www.awe.co.uk/
SGR (2013); Nicholls (2011)

Corporations and military R&D

- Majority of military R&D (including gov-funded R&D) takes place within industry
  - Represents a subsidy estimated at £500m annually
- UK home to major military corporations
  - BAE Systems
  - Rolls Royce
  - Babcock
  - QinetiQ
  - Many others incl. subsidiaries of major foreign companies

• Often, government funds military R&D within industry and then purchases the resulting technology – effectively paying twice (SGR, 2005)
• Estimate of subsidy (Jackson, 2011)
• BAE Systems – Europe's largest arms company following takeover of several US contractors
• Rolls Royce – specialises in engines for ships, aircraft (2nd largest in UK)
• BAE Systems, Rolls-Royce, Babcock International all part of the consortium to build new nuclear-armed 'Successor' submarines
• QinetiQ – privatised government military labs (7th in UK)
• Aggressive lobbying – sit on many influential advisory committees

Military & UK universities

- Numerous paths for military funding of R&D in universities
  - About £200 million a year, but figures very uncertain
- Government schemes
  - Through military labs, civilian Research Councils etc
- Corporate schemes
  - Large programmes run by Rolls Royce, QinetiQ
- Joint government-industry schemes in recent years
  - e.g. Defence Technology Centres (DTC)

• Government schemes run in conjunction with: Defence Science and Technology Labs (DSTL); Engineering and Physical Sciences Research Council (EPSRC)
• References: SGR (2005; 2007; 2008); Parkinson (2015)

Which universities?

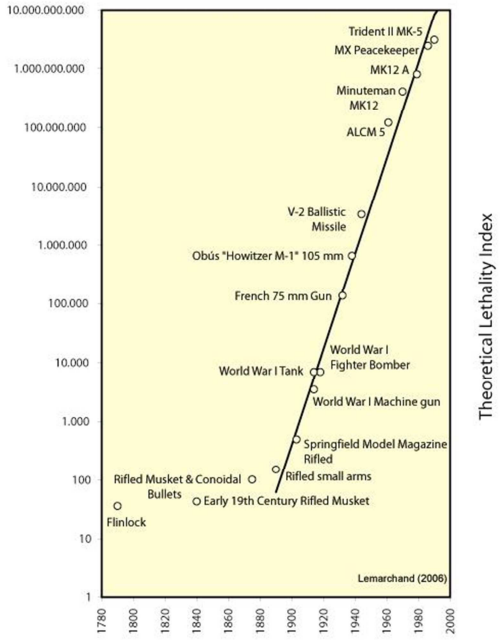
- Main studies
  - 29 universities, 4 national programmes (2005)
  - 26 universities, mainly Russell Group (2007)
  - 16 universities, random sample (2008)
  - 53 universities with AWE funding (2014)
  - Work mainly carried out by SGR, Campaign Against Arms Trade, Nuclear Information Service
- Universities receiving most military funding
  - Cambridge, Cranfield, Imperial College London, Oxford, Sheffield
- Are there any without military funding?

- A few other smaller studies have been carried out as well.
- A list of studies, with references, is provided in: Parkinson (2015).

Six key problems of military R&D

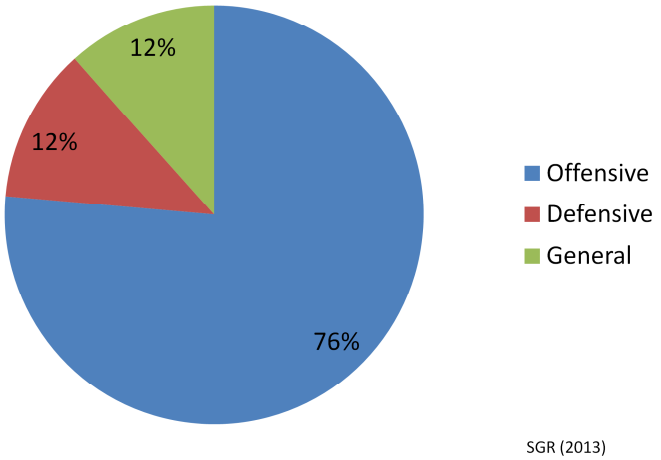
1. Increase in destructive power of weapons systems

- Theoretical Lethality Index
  - maximum number of casualties per hour that a weapon can generate
- Military R&D has been a key factor in exponential growth in lethality of weapons during 20th Century



• Theoretical 'Lethality Index' first proposed in 1979 by Colonel Dupuy
• It includes consideration of: rate of fire, number of targets, relative effectiveness, range effects, muzzle effects, accuracy, reliability, etc.
Graph from Lemarchand (2007).

UK military R&D: main roles



SGR (2013)

Total military R&D spending, 2008-11: £5.4 billion

- Classifications based on military/ academic literature – discussed further in SGR (2013)

2. Contributing to high civilian casualties

Conflict	Percentage civilian
World War I (1914-18)	45%
World War II (1939-45)	70%
Iraq War (2003-11)	At least 79%

Key factors leading to high civilian casualties:
- destructiveness of modern weapons
- targeting of civilians and infrastructure
- low tech responses, e.g. hiding among civilians

Use of modern technology in war has **not** reduced proportion of civilian casualties

A range of different factors have
Total number of deaths:
- World War I – about 15 million (including indirect deaths)
- World War II – about 66 million (including indirect deaths)
- Iraq War – 162,000 (violent death only)

Sources: White (2012); IBC (2012).

3. Failures of ‘precision’ weapons

- Recent drive to create more accurate ‘precision’ weapons (eg missiles) to reduce civilian casualties
- Academic study of 14,000+ violent incidents during Iraq War
  - Suicide bombs: 16 civilian deaths per incident
  - Air-strikes: 17 civilian deaths per incident
- Rise of armed drones
  - Use outside the battlefield – war crime?
  - Future potential for autonomous drones

- Most common ‘precision’ weapons are missiles launched from aircraft
- Iraq War study by Kings College London: analysis of 14,196 incidents involving 60,481 civilian deaths in Iraq 2003-08 (Hicks et al, 2009)
- Other problems with armed drones:
  - lower threshold for military response?
  - small-scale drones are a particular weapons proliferation threat
  - may make terrorist response more likely
- More info in (e.g.): Drone Wars UK (2012); Open Briefing (2013)

4. Driving export/ proliferation of weapons

- To help spread R&D costs, military tech is exported to other nations
- Example: UK exports to Saudi Arabia
  - Licenses granted for £6.5bn over last 5y
  - Exports include combat planes, bombs, military support vehicles, components
  - Use in Yemen war violating humanitarian law
- Exports of drone technologies will fuel international military threat

Campaign Against Arms Trade (2016a, 2016b)

5. Overconfidence in use of military force

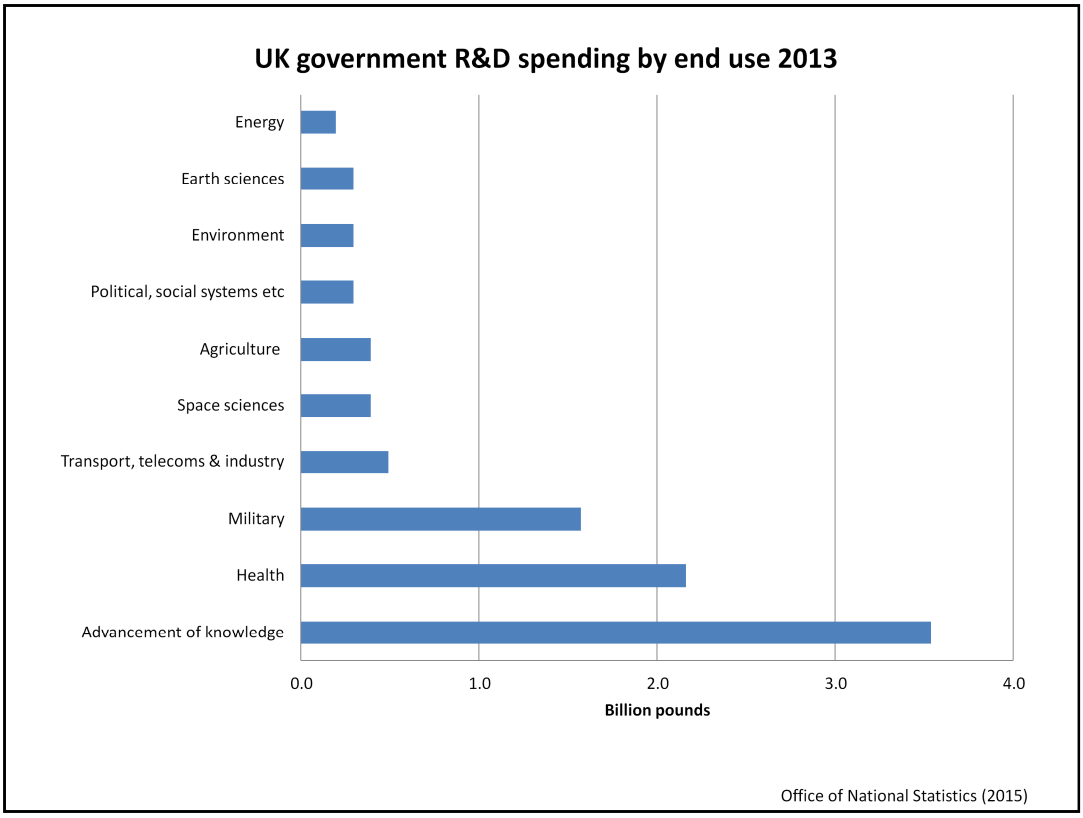
- Flawed belief that military technology allows wars to be won quickly and cleanly
- Side effects of war
  - Destruction of infrastructure
  - Unsecured weapons
  - 'Blowback'
- Military R&D fuels arms races
  - Even with allies

• Blowback is the unintended consequences of a military/ covert operation that are suffered by the civil population of the aggressor government or its allies.

6. Opportunity costs

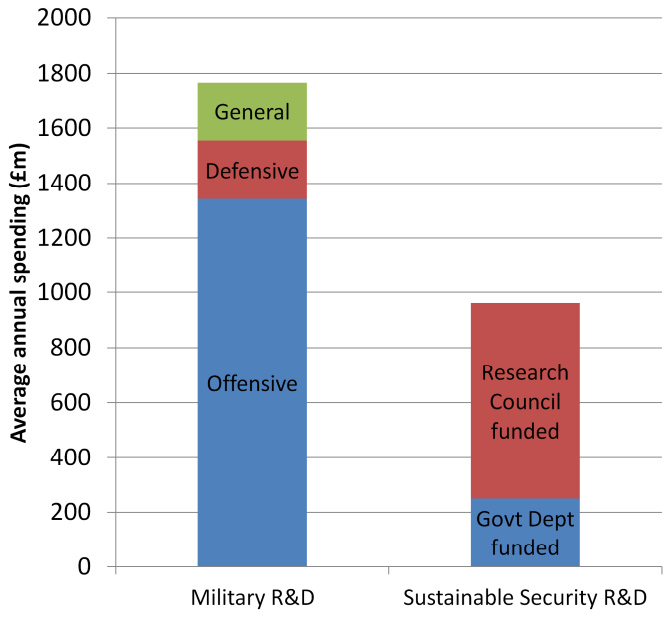
- Financial and technical resources could be used elsewhere
- Science and technology needed to help solve other urgent problems
  - International poverty/ injustice
    - Malnutrition, clean water etc
  - Global environmental problems
    - Climate change; biodiversity loss etc

➢ Need to help tackle the root causes of conflict



• Latest analysis by Office of National Statistics – Office of National Statistics (2015). Table 8.
• Military R&D is spending by Ministry of Defence.
• Earth sciences includes mining.
• Private R&D spending (by arms companies) is smaller and less certain – around a few hundred million pounds (SGR, 2005)

Comparing UK security R&D (2008-11)



SGR (2013)

• Sustainable security R&D spending includes: international development and poverty alleviation, climate change impacts, sustainable energy technologies, food security, international relations, natural resource management, biodiversity, environmental risks and hazards, sustainable consumption and other measures to mitigate and adapt to climate change

• The concept of sustainable security was defined in Oxford Research Group (2006)

Campaigning/ Education: Making the case for a shift in science and technology resources

SGR programmes

- Military Influence on Science and Technology
  - Research
  - Advocacy: scientists/ campaigners/ policy-makers
  - Related work on arms conversion
- Science4Society Week
  - Activities for school children
- Ethical Careers in Science, Design and Technology
  - Info for university students

Webpages:

http://www.sgr.org.uk/projects/military-influence-scitech

http://www.sgr.org.uk/projects/science4society-week

http://www.sgr.org.uk/projects/ethical-careers

Other UK organisations

- Campaign Against Arms Trade
  - Universities campaigning
  - Arms to renewables
- General
  - Forces Watch, Peace Education Network, Oxford Research Group, Article 36 etc
- Technology specific
  - CND, ICAN-UK, Drones Campaign Network etc

List of UK peace groups at:

http://www.networkforpeace.org.uk/members

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