Finding an Ethical Career

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Scientists for Global Responsibility
Scientists · Architects · Engineers · Technologists

SGR
Promoting ethical science, design and technology

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

- Slides of a presentation given at York University, 10 February, 2011
- Main focus will be science and technology careers, but much of the information will be relevant to others.

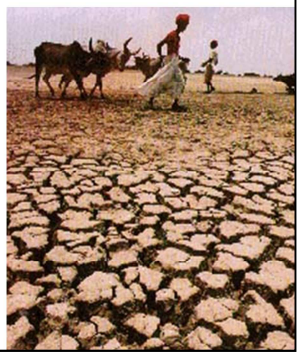
Scientists for Global Responsibility

- Independent organisation of 1000 natural scientists, social scientists, engineers, architects, IT workers
- Promotes science, design and technology which contributes to reduction of conflict, environmental protection, social justice
- Ethical careers publications and website
- Education and support network

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

Why an ethical career?

Current global problems



Social/ health problems

- Social justice
  - 1.4 billion people live in extreme poverty
    - Most malnourished, inadequate supply of clean water & sanitation etc
  - People in high-income countries live 20y longer than those in low-income countries
- Disease & ill-health
  - Major killers (1 million+ per year) include:
    - heart disease; cancers; AIDS; diarrhoea; tuberculosis; malaria; road crashes

• Extreme poverty – defined as living on less than $1.25 a day; amounts to 1 in 5 of world's population - World Bank (2008).

• Life expectancy figures - World Bank (2009).

• Disease – heart disease & cancers more prevalent in wealthier countries; infectious diseases prevalent in less wealthy countries - WHO (2004).

Environmental problems

- Climate change
  - Of 29,000 environmental data sets, 89% show changes consistent with a warming world
  - Kofi Annan's think-tank estimates 300,000 additional deaths per year
  - Wide range of other impacts
- Biodiversity loss
  - 'Sixth major extinction event'
    - Extinction rate is 100-1,000 times that in fossil record
  - Humans very dependent on ecosystems

• Climate change – environmental datasets from IPCC WGII (2007); additional deaths: increases in weather related disasters; increase in ranges of infectious diseases; heat stress etc from Global Humanitarian Forum (2009)

• Biodiversity loss - Human activity has caused between 100-1,000 times more extinctions in the last 100 years than would have happened due to natural processes alone (Millennium Ecosystem Assessment, 2005; UNEP, 2007). Half the world's forests, half the world's wetlands have been destroyed by human activities; over-fishing has caused 90% of large ocean predators to be lost (Worldwatch Institute, 2004, p17)

Security problems

- War and weapons
  - 1/3 million people die each year in wars and other armed violence
  - 17 wars ongoing
  - 23,000 nuclear weapons
  - Global military spending
    - $1,500,000,000,000 per year

• Casualty figures - Control Arms campaign (2011).

• Nuclear weapons – >90% held by USA and Russia; more than 2000 on 'high-alert'; UK holds nearly 200 – enough to cause global devastation - Federation of American Scientists (2010).

• Figures for global military spending and number of wars - SIPRI (2010).

Future projections

- Population
  - From nearly 7 billion now to 9 billion by 2050
- Energy consumption
  - 45% increase by 2030
- Food consumption
  - 40% increase by 2030
- Water consumption
  - ~35% increase by 2025
- Climate change, biodiversity loss accelerating
- Depletion of fossil fuels, minerals

• These figures are from mid-range 'business as usual' scenarios (based on stats from international organisations such as IEA and UN FAO) - Beddington (2009).

• 'Peak oil' and other mineral depletion problems will compound Beddington's concerns

A ‘Perfect Storm’?

- Prof John Beddington, UK Chief Scientific Advisor, warns about:
  - threat of a ‘perfect storm’ of global shortages in food, water and energy by 2030

Beddington (2009).

Science and technology can help us tackle these problems or can make them worse

Example of ethical concerns: Arms sector

- UK foreign/ military policy
  - Major military spender (4th in world)
  - High 'offensive' capability
    - nuclear weapons; long-range ships/ aircraft
  - 'Illegal' Iraq war
- International arms trade
  - Sales support 'oppressive regimes' & fuels conflict
  - Diverts funds away from development programmes
- Corporate misbehaviour
  - BAE Systems fined over £280 million
  - Revolving door

• High military spending and large offensive weapons capability increases international tensions, fuels arms races and diverts funding from other needs.

Sources: SGR (2006a, 2007); SIPRI (2010); BBC News (2010).

York University connections

- FLAVIIR
  - £6.2m research programme on robotic aircraft with BAE Systems
  - 10 universities including York
- Total military/ arms industry funding of £7.7m from 2001 to 2006
- Pension funds

• FLAVIIR – ‘Flapless Aerial Vehicle Integrated Interdisciplinary Research’; aircraft is called the ‘Demon’; first test flight in September 2010

• Main arms companies involved with York: BAE Systems; QinetiQ; Rolls-Royce

• York University has an ethical investment policy (adopted in 2009), but its pension funds are still partly invested in the arms industry

Sources: FLAVIIR (2011); Drones Wars UK (2010); The Engineer (2010); Campaign Against Arms Trade et al (2007); The Yorker (2009)

Broader ethical concerns

- Irresponsible behaviour of global financial sector
- Economic goals given priority over social and environmental goals
  - in most industries
  - in many universities
- Driven by government's 10y science and innovation plan

• Science and innovation investment framework 2004-2014 (HM Treasury et al, 2004).

• Numerous more detailed strategies have been enacted since 2004.

Social/ environmental career options

Rise of the ‘green collar’ sector

- Low carbon and environmental goods and services (LCEGS) sector
- Global market for LCEGS estimated at ~£3,000,000,000,000 and growing fast
- In UK, LCEGS sector employs nearly 900,000 people
- About 2.3 million work in renewable energy industries worldwide

• *Environmental sector* (190,000) **-** including energy, carbon and broader environmental consultancy, air pollution control, environmental monitoring, marine pollution control, waste management, recovery and recycling; as well as the service industries that support environmental management.

• *Renewable energy sector* (260,000) **-** including wind, wave and tidal, biomass, geothermal, hydro and photovoltaic energy generation and the services that support them, including renewables consultancy.

• *Emerging low carbon sector* (430,000) **-** including alternative fuels such as nuclear, and alternative fuels for vehicles, carbon capture and storage, building technologies, energy management and carbon finance.

• NB: figures in brackets refer to employment

• Estimated UK market value is total of £106 bn

• Sources: Department for Business, Innovation and Skills (2009); UNEP/ Worldwatch Institute (2008).

UK low carbon plans 2009

- Low Carbon Transition Plan
- Low Carbon Industrial Strategy
- Renewable Energy Strategy
- Carbon Reduction Strategy for Transport
- Complemented by broader policies in other areas:
  - Energy, transport, building and construction, science and innovation, sustainable development etc

Main points:

• 34% cut in greenhouse gas emissions by 2020 (from 1990 level)

• 15% of energy from renewable sources by 2020 (tenfold increase)

• New nuclear power stations*

• Efforts to substantially improve building energy efficiency

• Working for major improvements in transport efficiency, including cars, trains and aircraft

• Economic measures (eg carbon trading*) to encourage energy efficiency across the whole economy

• R&D especially on marine energy, and efficient cars and aircraft

• Over 100,000 new jobs by 2015

*Most controversial

Main source: DECC (2009).

Recent developments

- UK world leader in deploying offshore wind
- 'Green Deal'
  - National programme for major improvement in energy efficiency
- New manufacturing, e.g.
  - Wind turbines
    - Glasgow & Dundee – Gamesa
    - Hull – Siemens
  - Solar panels
    - Wrexham – Sharp

Jowit (2010); DECC (2010); BBC News (2011a); The Guardian (2011); BBC News (2011b).

Green jobs – some examples

- Research
  - e.g. climate scientist, ecologist, computer modeller
- Engineering
  - e.g. renewable energy (manufacturing & installation), energy efficiency in homes/ industry
- Project management
  - Key in making things happen
- Environmental consultancy
  - Advice to industry & government on reducing emissions
- Education and campaigning
  - Including use of distance learning, websites, social networking, email

UK health sector

- National Health Service
  - Employs 1.7 million people
- Numerous health charities
- Strong R&D
- Social sciences as important as biological sciences in (e.g.):
  - Encouraging healthy lifestyles, improving mental health, improving health services

NHS (2010).

Arms control/ disarmament

- Key treaties
  - Nuclear non-proliferation treaty; Test ban treaties; NWFZ treaties; US-Russian treaties
  - Chemical weapons convention; Biological weapons convention
  - Conventional forces in Europe treaty; Mine ban convention; Cluster bomb convention; Arms trade treaty*
  - Outer space treaty; PAROS treaty*

*proposed

• NWFZ – Nuclear weapons-free zones; PAROS – Prohibition of an arms race in outer space

• Sources: UN Office for Disarmament Affairs (2010a); Federation of American Scientists (2005).

Arms control/ disarmament

- Arms control treaties operate through mechanisms for monitoring, verification and decommissioning
- These carried out by UN offices/ treaty secretariats/ country officials/ military
- Support also from academics, NGOs
- UK examples:
  - UK Mission on Arms Control & Disarmament
  - Vertic

• Sources: UN Office for Disarmament Affairs (2010b); UK Mission on Arms Control and Disarmament (2010); Vertic (2010)

International development

- Dept for International Development
  - UK government ministry
  - Funding increased
  - Employs engineers and scientists
- Practical Action
  - Aid organisation specialising in ‘appropriate technology’ in developing countries
- Engineers Without Borders
  - Volunteer aid projects overseas

Dept for International Development (2011); Practical Action (2011); Engineers Without Borders UK (2011)

A tale of two sectors...

UK arms industry

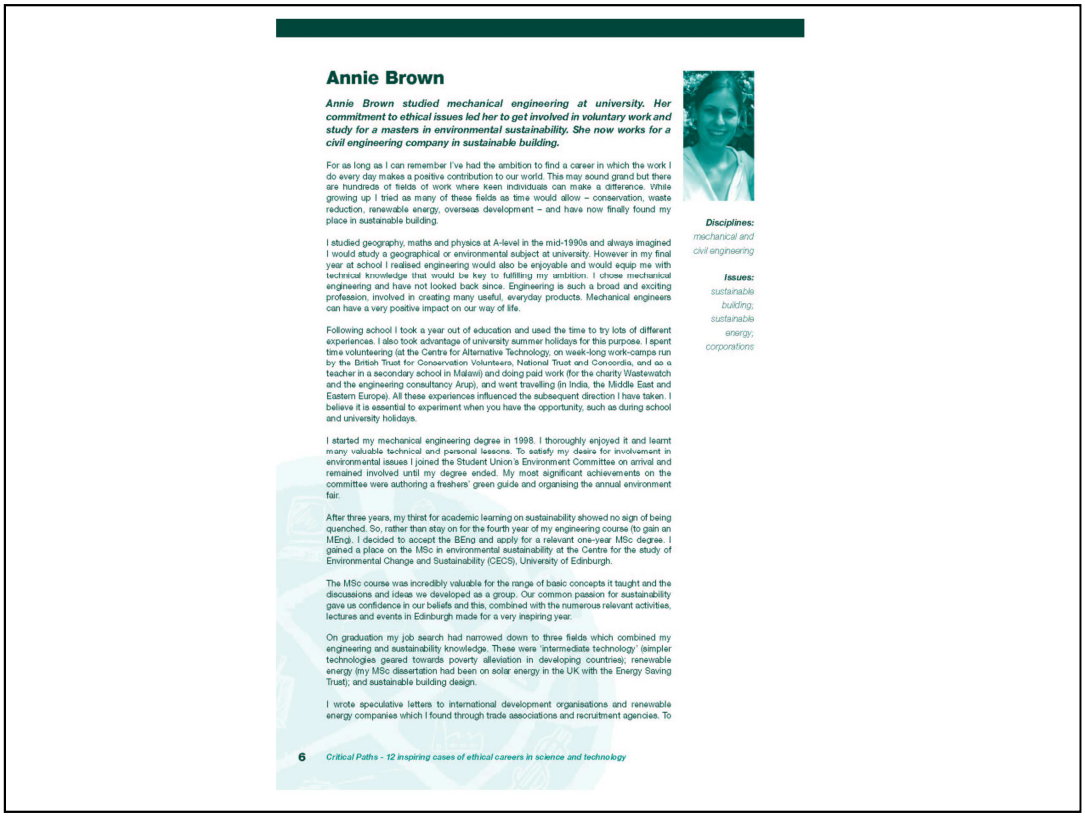
- Current employment
  - 215,000
- Shrinking following Defence Review

UK low carbon/ env sector

- Current employment
  - 880,000
  - including 260,000 in renewable energy
- Rapidly expanding

Defence Analytical Services and Advice (2009); Innovas (2009)

Steps towards an ethical career....



Annie Brown

Annie Brown studied mechanical engineering at university. Her commitment to ethical issues led her to get involved in voluntary work and study for a masters in environmental sustainability. She now works for a civil engineering company in sustainable building.

For as long as I can remember I've had the ambition to find a career in which the work I do every day makes a positive contribution to our world. This may sound grand but there are hundreds of fields of work where keen individuals can make a difference. While growing up I tried as many of these fields as time would allow – conservation, waste reduction, renewable energy, overseas development – and have now finally found my place in sustainable building.

I studied geography, maths and physics at A-level in the mid-1990s and always imagined I would study a geographical or environmental subject at university. However in my final year at school I realised engineering would also be enjoyable and would equip me with technical knowledge that would be key to fulfilling my ambition. I chose mechanical engineering and have not looked back since. Engineering is such a broad and exciting profession, involved in creating many useful, everyday products. Mechanical engineers can have a very positive impact on our way of life.

Following school I took a year out of education and used the time to try lots of different experiences. I also took advantage of university summer holidays for this purpose. I spent time volunteering (at the Centre for Alternative Technology, on week-long work-camps run by the British Trust for Conservation Volunteers, National Trust and Concordia, and as a teacher in a secondary school in Malawi) and doing paid work (for the charity Wastewatch and the engineering consultancy Arup), and went travelling (in India, the Middle East and Eastern Europe). All these experiences influenced the subsequent direction I have taken. I believe it is essential to experiment when you have the opportunity, such as during school and university holidays.

I started my mechanical engineering degree in 1998. I thoroughly enjoyed it and learnt many valuable technical and personal lessons. To satisfy my desire for involvement in environmental issues I joined the Student Union's Environment Committee on arrival and remained involved until my degree ended. My most significant achievements on the committee were authoring a freshers' green guide and organising the annual environment fair.

After three years, my thirst for academic learning on sustainability showed no sign of being quenched. So, rather than stay on for the fourth year of my engineering course (to gain an MEng), I decided to accept the BEng and apply for a relevant one-year MSc degree. I gained a place on the MSc in environmental sustainability at the Centre for the study of Environmental Change and Sustainability (CECS), University of Edinburgh.

The MSc course was incredibly valuable for the range of basic concepts it taught and the discussions and ideas we developed as a group. Our common passion for sustainability gave us confidence in our beliefs and this, combined with the numerous relevant activities, lectures and events in Edinburgh made for a very inspiring year.

On graduation my job search had narrowed down to three fields which combined my engineering and sustainability knowledge. These were 'intermediate technology' (simpler technologies geared towards poverty alleviation in developing countries); renewable energy (my MSc dissertation had been on solar energy in the UK with the Energy Saving Trust); and sustainable building design.

I wrote speculative letters to international development organisations and renewable energy companies which I found through trade associations and recruitment agencies. To

Disciplines:
mechanical and civil engineering

Issues:
sustainable building; sustainable energy; corporations

Example profile from SGR (2006b)

- Interested in environmental issues at school
- Took a year out volunteering before university
- Became interested in engineering – chose it as degree subject
- Did MSc in environmental sustainability
- After university, took a junior office post in renewable energy company
- Then got a job in building services engineering – energy efficiency is big part

Guiding principles

1. Apply precautionary principle
   - e.g. health/ environmental concerns
2. Guard against malicious use
   - e.g. weaponisation, criminal use
3. Follow democratic principles
   - e.g. corporate benefits before public benefits?
4. Consider distributional effects
   - e.g. improvement for low income communities?

• Precautionary

If possibility/ likelihood of significant health/ environmental harm, must put in place safeguards – sometimes this means not developing the technology. Uncertainties are important and should be investigated. Hi-tech solutions (based on cutting-edge science) are inherently more uncertain.

Consequences: work for organisations with clear environmental/ health goals, or actively applying the precautionary principle through, eg, assessing new technologies for health/ environmental effects, or assessing whether intermediate technology or non-technological options offer a better solution

• Malicious use

How easy is it for you work to be intentionally misused, eg weaponised? Particular concern is military work, eg is it encouraging a focus on military solutions to political problems? Are arms/ equipment being sold to countries with bad human rights records?

Consequences: look at military policies of governments which are funding the work; easiest to avoid working for military or taking military funding, or only working on, eg, disarmament projects

• Democracy

Vested interests such as big corporations and military can direct scientific and technological work in their favour – which is not necessarily in the best interests of society. Public involvement in decisions on science and technology is generally very limited.

Consequences: work for organisations with clear social/ environmental goals and rather than narrow economic/ military ones, and/ or who actively engage with the public over scientific controversies

• Distribution

New technologies can exacerbate social inequalities rather than help tackle them. Hi-tech solutions tend to be expensive, and hence intermediate technologies or non-technological options may be fairer.

Consequences: work for organisations with clear goals in terms of equitable development, and involve public dialogue over technologies

• Look for contribution to peace, social justice, and environmental sustainability

Which Employer?

	Work Freedom	Influence on Policy	Influence on Technology	Ask ethical questions?	Pay
Academia	★★★	★?	★★	★★★	★★
Government	★	★★★	★★	★	★★
Industry (big)	★	★★	★★★	★	★★★
Industry (small)	★	★	★★★	★★	★★
Non-profit (eg pressure group)	★★	★★	★	★★★	★

Tips on being successful…

- Educate yourself on the wider social/ environmental issues affecting your field
- Don’t be fooled by ‘greenwash’
- Incrementalist or revolutionary?
- Develop your ‘transferable skills’
- Get voluntary/ vacation experience beyond science & technology
- Get support

You can make a difference!!

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