chain reaction

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The National Magazine of Friends of the Earth Australia

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EMERGING TECHNOLOGIES & CORPORATE CONTROL

- Patent law and climate engineering
- The brave new world of synbio
- Critical scholarship in a hostile climate
- Corporate efforts to impede renewable energy
- Regulatory failure or institutional corruption?
- Corporate influence over nanotech regulation
- National Enabling Technologies
- Strategy Techno-utopian narratives and corporate control
- #Crazytech

Congratulations to Muckaty Traditional Owners for defeating the government's plan to impose a nuclear waste dump on their land in the NT. Pictured are Muckaty Traditional Owner Dianne Stokes with Nat Wasley from the Beyond Nuclear Initiative.

www.foe.org.au/muckaty-winnerz

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Friends of the Earth Australia

FoE Australia News

Friends of the Earth (FoE) Australia is a federation of independent local groups.

You can join FoE by contacting your local group – see the inside back cover of Chain Reaction for contact details or visit foe.org.au/local-groups

There is a monthly FoE Australia email newsletter – subscribe via the website: www.foe.org.au

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Renewable Energy Target Road Trip

The Abbott government has initiated a review of the Renewable Energy Target (RET) – Australia's flagship renewable energy policy. It is widely feared that the review will result in a watering down of the target, and hence damage the investment climate for renewable energy in the country.

In May, FoE's Yes 2 Renewables campaign launched its fact-finding RET Review Road Trip at the Hepburn Wind farm in Victoria – the birthplace of community energy in Australia to highlight the benefits that have come from the RET target. The visit to the Hepburn Wind farm was the first stop of an 11-week road trip to get a real understanding of the impact the Renewable Energy Target has had on communities in south eastern Australia.

We visited a range of places that have benefitted from renewable energy projects or experienced the impacts of fossil fuel pollution. This included manufacturing facilities in Portland in south west Victoria, the Latrobe Valley, where communities have been badly impacted by a major fire at the Hazelwood coal mine over summer, and suburbs where there has been significant uptake of roof top solar. We finished the tour in the wind region around Canberra, and helped co-host a major event at Parliament House in Canberra for world wind day in mid June.

More information: http://yes2renewables.org/2014/04/08/yes-2-renewables-launch-ret-road-trip

Steve Marsh court case

Steve Marsh is an organic farmer from a community south of Perth in Kojonup, WA. In 2010, the WA government lifted the ban on GM canola, allowing for the commercial cultivation of this GM crop for the first time. As a result, many farmers, including Marsh's neighbour, began growing GM canola. Subsequently, Steve found GM canola plants spread over much of his farm, containing seed. Steve lost his organic certification.

This contamination has had a dramatic impact on Steve and his livelihood, while Monsanto, because of their 'no liability' agreement signed with each GM farmer, are free of any responsibility for GM contamination. Instead of accepting this biotech invasion, Steve decided to take a stand. As the only avenue available, Steve took his neighbour to court for compensation of loss and damages. This case is the first of its kind in the world, where an organic farmer is seeking compensation from a GM farmer when his rights have been violated by GM contamination.

On May 28, the judgment came down in Steve's case. We are very disappointed to report that Steve lost the case. Steve is currently considering his options.

For further information, and documents from the case, please check the Safe Food website. http://safefoodfoundation.org/what-we-do/help-this-farmer/

Campaign against CSG extraction at Nguddaboolgan (Mt Mulligan)

A series of events are planned for Far North Queensland over the next few months by a coalition of traditional custodians, landholders, concerned people and FoE Kuranda to inform the general public about the detrimental impacts from unconventional gas extraction. This development may include 'fracking' within a 550 sq km area around Nguddaboolgan (60 kms north-west of Mareeba), one of Australia's most sacred and culturally significant sites.

There are real concerns that the underground aquifers and iconic the iconic Mitchell and Walsh Rivers could be polluted as a result. Fracking at Nguddaboolgan could be the first step to opening up the rest of North Queensland to this particularly destructive form of mining. No tier of government has conducted any community consultation on this proposed development to date.

Meanwhile, FoE Kuranda has an ongoing campaign to improve the water quality of the Barron River, which is polluted with intensive agricultural runoff and sediment. This polluted river is damaging the Great Barrier Reef and is also a threat to the health of the people of Kuranda and Mareeba that take their town water supply from the river.

Climate change related displacement

Very positive feedback followed a symposium held in Brisbane on May 23, titled 'When people have to move: Climate change related displacement and pre-emptive migration pathways in the Australia-Pacific region', jointly organised by the QUT Faculty of Law and the Climate Frontlines collective of FoE Brisbane.

Some highlights of the program were:

- Setting the Scene: Experiences of Displacement – a combined short videos and commentary presentation by SBS journalist Stefan Armbruster.
- Overview of International Frameworks, with presentations by QUT's Dr Rowena Maguire and FoE's Claire van Herpen.
- The Pacific and International Negotiations, with contributions from Peter Emberson, Pacific Conference of Churches; Dr Ian Fry, ANU lecturer and advisor to the Prime Minister of Tuvalu on UNFCCC negotiations; Ratu Manasa Katonivualiku, Fiji Ministry of Foreign Affairs, involved in the development of a national relocation plan; and QUT's Bridget Lewis, on regional responses to displacement.
- Migration Pathways: Programs and Experiences, including analysis of existing programs in both Australia and New Zealand, their potential for expansion, and new initiatives.
- A mock trial: The case for climate 'refugees'.
- A final panel discussion on the way forward, moderated by independent Pacific journalist Nic Maclellan, with participation by Senator Larissa Waters.

A summary of the presentations is in preparation and will be available for public circulation in the near future. It will be circulated to all federal and state politicians who were invited to the symposium. A special edition of the QUT Law Review will be dedicated to contributions from symposium presenters with a legal focus.

Claire van Herpen addressing the May 23 symposium.

Contact: wendy.flannery@foe.org.au

Food safety under threat from GM crops

Worldwide marches were held in May to express concerns about the food domination plans of megacorporations like Monsanto. Many people are concerned that food safety is under threat as multinational biotech corporations attempt to gain total control of the food supply and force us to eat their genetically engineered food whether we like it or not; effectively treating us like a giant science experiment.

The Adelaide March Against Monsanto rally was organised as a project of FoE Adelaide's 'Fair Food Adelaide' collective. It built momentum for a continuation of a GM-ban across South Australia, and pressure to implement this ban in other states.

SA is the only mainland state to have a moratorium on commercial GM but food labelling and testing are currently inadequate and we want that to change. The rally was joined by SA's Minster for Agriculture Leon Bignell, Senator Nick Xenophon and Greens MLC Mark Parnell.

More information: www.march-against-monsanto.com

– Robyn Wood, FoE Adelaide

March Against Monsanto rally in Adelaide, May 2014.

World Parks Congress in Sydney in November

Sydney will host the sixth World Parks Congress from November 12–18. The Congress is held every 10 years by the International Union for the Conservation of Nature, and it's expected that as many as 3000 people will attend, including government, NGO and industry representatives, Indigenous and community leaders and researchers and scientists from across the world. The theme for this year's congress is *People, Parks and Planet: Inspiring Solutions.* FoE has been keeping in touch with congress preparations; networking with our fellow eNGOs on issues of common interest; and will be hosting side-events during the congress itself. There are plenty of opportunities to help out through your local FoE group, to volunteer at the congress itself, or to attend as a member of the public.

For more information contact nick.mcclean@foe.org.au or visit http://worldparkscongress.org

Fair Food Adelaide launch

On May 8, 50 people gathered at the Box Factory community centre in Adelaide to discuss the future of the local food movement in South Australia. Hosted by Fair Food Adelaide, a collective of FoE Adelaide, the event offered an opportunity for representatives from farms, businesses, activist and community organisations to engage in an energetic workshop, which focused on generating critical food sovereignty ideas.

Led by facilitator Kim Hill from Deep Green Resistance, the discussion started with a question about the exciting things that are happening already in food sovereignty. The answers ranged from the current trend of growing your own food, verge farming in the suburbs, young farmer scholarships and a new event for 2014, started in SA, called supermarket-free month.

The discussion then moved onto goals for 2014 and how to make this happen. Events that focus on food education, foraging and expanding the definition of 'food' to include natives and weeds were key issues discussed. Minimising waste, creating recipes, food swaps and supporting organisations that facilitate these swaps like Ripe Near Me were popular ideas.

More information about the discussion and outcomes is available from Fair Food Adelaide coordinator Rachel Ryan: ryan.rach@gmail.com

Irradiated food

The amount of irradiated food in the Australian and New Zealand diet is set to increase, and there is strong pressure to remove mandatory labelling for irradiated food. In 2014, Food Standard Australia New Zealand (FSANZ) will be reviewing mandatory labelling requirements for irradiated food. It is clear from publicly accessible documents that the review is framed in a manner to question the need for labelling of irradiated products rather than as a non-biased overview of the efficacious of irradiation labelling.

Food Irradiation Watch, a FoE affiliate, believes it is a consumer right to know whether food has been irradiated as well as a food producer's right to ensure that their non-irradiated food is clearly distinguishable from irradiated products. The only way to guarantee consumers an informed decision and to safeguard producers from potentially negative consumer association of their product is to ensure clear mandatory labelling.

More information:

w: www.foodirradiationwatch.org

f: www.facebook.com/groups/212241255452651/

ph: 0411 118 737

– Robin Taubenfeld, Food Irradiation Watch

FSANZ fails to ensure safety of foods containing nanomaterials

A report released in May by FoE's Emerging Technologies Campaign (previously Nanotechnology Campaign), titled 'Way too little', looks at the now widespread presence of nanomaterials in the food chain and how little Food Standards Australia New Zealand (FSANZ) is doing to ensure our safety. There has been a dramatic increase in the use of nanomaterials in food, food additives, supplements, food packaging, food contact materials and agricultural chemicals. At the same time there is a growing body of peer-reviewed evidence that certain nanomaterials may pose risks to human health. Yet FSANZ has failed to take even basic steps to regulate the use of nanomaterials in food; they don't know what nanomaterials are in food or where they are being used; and do not require even basic safety testing.

The report is posted at:

http://nano.foe.org.au/sites/default/files/FOE_nanotech_food_report_low_res.pdf

Keeping Euros out of dirty coal in Australia

In May, FoE affiliate Market Forces visited Europe where several banks that are key to new coal export projects in Australia were holding their annual general meetings.

After Market Forces attended its AGM, and with support from a strong local campaign, HSBC agreed that it would not fund the Abbot Point coal export expansion in Queensland. The group chief executive of HSBC said that given UNESCO's strong concerns about the expansion of Abbot Point, the bank would be "extraordinarily unlikely to go anywhere near it".

Deutsche Bank also made an important commitment at its AGM which could help encourage more banks from financing the expansion of coal exports in Australia. Deutsche Bank's chairman agreed that the bank would not consider any request to finance the expansion of the Abbot Point coal export port, given the concerns of UNESCO over the proposed expansion's impacts on the Great Barrier Reef World Heritage Area.

More information: www.marketforces.org.au/europecoalfinance

Challar forest protest camp

FoE is supporting an ongoing camp established in south-west WA, established in December 2013 to protest the logging of the Challar forest. Challar blocks 09 and 08 are logged by Forest Products Commission (FPC) of WA. It is a government agency, logging the last karri stands in the area and replacing them with plantations. The forest also contains a mix of jarrah and marri with ancient, 7m grass trees which can live for 950 years. The local community has been protesting against this needless destruction.

In Memory of Cate Kyne

Cate Kyne was a life long activist who was well known around Melbourne, especially in her home patch in Northcote. Over many decades she remained steadfastly committed to grassroots campaigning and progressive political issues. She was a proud feminist, supported local community sustainability and climate campaigns, and in her later years was active in the Transition Towns movement. She was a member of FoE for many decades.

Cate passed away in 2009. With a generous bequest from her estate, the Caty Kyne Memorial Scholarship Award was established to assist community development practitioners and activists from the Global South to attend events and conferences. A large proportion of the estate was donated to Friends of the Earth. We would like to thank Cate for her ongoing commitment and work towards a more just and sustainable world.

Your passion for the environment and social justice can also last beyond your lifetime. By leaving a bequest to FOE you will help to protect the places you love for future generations and enable others to continue the struggle for a better world. If you would like further information on our bequest program, please contact Sam Cossar-Gilbert in our campaigns office in Melbourne: sam.cossargilbert@foe.org.au, call 9419 8700 or 0435 844 084.

Brisbane G20 Peoples Convergence, Nov. 8-16

The G20 Leaders Summit will bring the leaders of the worlds' 20 largest economies to Brisbane in November this year. The "austerity" budget that has just been delivered to Australians is a small taste of what people around the world have been experiencing under G20 driven economic systems – systems which prioritise profit over community welfare and the environment. There is an alternative!

BrisCAN-G20 is a broad network of groups concerned about the social and ecological impacts of the G20. We see the G20 Summit as an opportunity to unite and work on transforming our society to a more just and sustainable one.

First Nation's Decolonisation Before Profit events will run through the week Nov 8–16 and will include a Global First Nations Conference on Nov 15–16 and an Eco-Village forum space. For more information visit http://brisbaneblacks.com/g20/program

Peoples Convergence: We will be hosting and supporting a week symposiums, workshops, idea sharing, marches, film screenings, and other creative events, November 8–16 in Brisbane.

Visioning Another World: The G20 Peoples Summit will be a three-day festival of symposiums, idea-sharing, art, creative activities, education and action. It will take place in various location in Brisbane November 12–14.

The Peoples Summit will be followed by two days of creative action, education and solidarity while the G20 Leaders Summit is taking place, including the **Peoples Rally and March** on November 15. Join us in this united call for global social and ecological justice!

Week of action: We are planning for vibrant community action to take place throughout the week of the G20 Summit. You are invited to contribute to the planned events and to organise your own creative response to the G20.

To register your interest in the Peoples Summit, volunteer, donate your time, skills or money or for more information:

e: briscang20@gmail.com
w: www.briscan.net.au
f: www.facebook.com/briscan.g20

Camp Seaspray

On-shore gas drilling stopped in Victoria until 2015

In 2012, a campaign launched by FoE Melbourne and Quit Coal was able to achieve the first significant environmental victory under the current Victorian government. The then Premier, Ted Baillieu, announced a moratorium on the process of fracking (hydraulic fracturing) and a ban on the use of the use of the dangerous BTEX chemicals in the gas drilling process.

Since then we have worked with dozens of regional communities to build the mobilised power that could force the government to also halt the exploratory drilling that was being proposed.

A cornerstone of the community opposition became focused around a plan by Lakes Oil to carry out horizontal drilling near Seaspray in Gippsland. Although the company lodged its application in December 2013, it took the government more than six months to make a determination on the application. This was because of the strong resistance from the Seaspray community.

The company refused to listen to the community and pressed ahead with its plan to drill. Working with the community, we had organised to bring seven locals to Melbourne to ride horses through the city to Parliament. They were going to announce their intention to blockade gas drilling operations if the Energy Minister approved the works application from Lakes Oil. A day before the ride, the state government announced that it would "put a hold on making any decisions on the approval of current onshore gas exploration work plans" until after the community consultation process – safely on the far side of the late-2014 state election.

We were aiming to stop an approval of horizontal drilling at Seaspray.

What we got was a halt to approvals across the state, until after the consultation process. This is a brilliant victory for the community. It is a testament to the power of sustained and determined community organising and the remarkable community of Seaspray, who have been on the front-line in the campaign against new oil and gas drilling.

Of course, the government hopes to take the heat out of the issue. They thought the same thing when they announced the moratorium on fracking, and when they extended the moratorium. We are currently working to ensure there is a strong turnout to the government's community consultation on unconventional gas. The next stage in this campaign is for the major parties to commit to making this ban permanent.

More information:

www.foemelbourne.org.au/coal_and_gas

www.foemelbourne.org.au/seaspray_story

Anti-wind farm laws cost Victoria jobs

FoE released a report in April detailing the economic and environmental costs of the Victorian government's anti-wind farm laws. The analysis shows that anti-wind farm laws introduced by former Premier Ted Baillieu hit the wind energy sector hard, costing jobs and investment opportunities for regional Victoria. Eleven proposed wind farms have been scrapped in recent years.

The report is posted at: http://tinyurl.com/wind-farm-laws

Radioactive Exposure Tour

The 2014 radtour was an epic adventure all the way from Melbourne to Muckaty (north of Tennant Creek) in the NT, site of a proposed radioactive waste dump. Forty people packed their swags, bags and instruments in five vehicles, three of which were powered with vege oil picked up from fish and chip shops and service stations along the way. Participants came from Australia, India, Japan, Vietnam, Indonesia, England, New Zealand and France.

Some highlights from the radtour:

- Talking to Mrs Eileen Wingfield, Kokatha elder, about her struggles against the radioactive waste dump proposal in South Australia (success!) and against the Olympic Dam uranium mine.
- Hearing from nuclear veteran and whistle-blower Avon Hudson about his time working at Maralinga
- Lunar eclipse on Arabunna country over Lake Eyre
- Camping at Walatinna Station, the home of Yankunytjatjara man Yami Lester, and hearing his story of the Emu Field nuclear test in 1953 that blinded him.
- Protesting at Pine Gap, the Joint US/Australia Defence Facility with Aranda woman, Mitch.
- Learning about the NT Intervention from local heroine and resident of Mt Nancy town camp resident Barbara Shaw
- Hitting the road to Tennant Creek with Uncle Kevin Buzzacott, defender of Lake Eyre and the beautiful Arabunna country north of the Olympic Dam mine
- Hearing Dianne Stokes continue to fight against the nuclear waste dump and inspire the radtour group to "go back and rattle the city!" as we sat on her traditional lands.
- A bush trip and starlight with the Muckaty mob defending their country from the proposed radioactive waste dump, which will be in court in June 2014.

Let us know if you want to be kept informed about plans for next year's radtour: email ace@foe.org.au

Since the radtour, campaigners from FoE's Anti-nuclear & Clean Energy (ACE) campaign have been working hard to support Muckaty Traditional Owners in their efforts to prevent the Abbott government foisting a nuclear waste dump on their land. We helped organised a public meeting and support actions when Traditional Owners were in Melbourne for a Federal Court hearing; took part in a national day of action on June 20; helped organise a crowdfunder for the Beyond Nuclear Initiative; and ACE campaigners have been in Darwin speaking to union and council representatives as well as attending a protest rally at Tennant Creek on May 25.

More information and photos:

http://radioactivetour.com

Stop Press: On June 19, Muckaty Traditional Owners won their campaign against a nuclear waste dump – details at www.foe.org.au/muckaty-winnerz

Earthworker Solar Water Heating

The Earthworker Cooperative is proud to be collaborating with Friends of the Earth to work towards a socially just and sustainable future. Heat your water with a solar hot water system from the Earthworker Cooperative and you'll be supporting local green jobs, reducing your energy bills, and if you mention this ad $80 will be donated to Friends of the Earth!

The BOLT-ON Solar Heat pump provides an efficient, affordable and easy way to go solar – even if you're renting, live in an apartment or have limited sun exposure. There is a special low-interest loan available to pay off an Earthworker solar hot water system (visit www.bankmecu.com.au/earthworker).

Earthworker is a community-led initiative, working to establish an Australia-wide network of not-for-profit community-owned cooperatives. Earthworker is now producing solar hot water systems in a factory in Dandenong. Each unit sold now is a step toward opening the first worker-owned factory in Morwell.

To find out more, go solar, or get involved with the cooperative, visit www.earthworkercooperative.com.au

Radtour participants and Alice Springs residents protesting at Pine Gap, May 2014.

Editorial: emerging technologies and corporate control

Jeremy Tager and Louise Sales

Regulation has all too often lagged behind technology development and commercialisation. Often new innovations aren't banned or regulated until after they have been proven to be harmful – and even then corporations frequently and fiercely resist regulation. DDT, thalidomide, asbestos, cane toads are all classic examples of what can go wrong when innovation is driven by corporate interests, the precautionary principle is not applied, and new innovations are launched before they are determined to be safe.

A suite of powerful new emerging technologies means that the stakes of such uncontrolled experiments are now significantly higher. The unexpected consequences of some of these technologies could have global ramifications.

Many of the issues that Friends of the Earth works on (e.g. climate, coal seam gas, nanotechnology and nuclear) are about challenging technologies that implicity rely on the idea that limitless economic growth is somehow possible and desirable. In order to resist dangerous, unsustainable and unjust technologies and ensure that useful technologies are used equitably we think it is important to shed light on the drivers of technology. This includes the extent to which technological innovation is driven by commercial and military interests and how governments' further these interests through the funding and promotion of certain technologies.

It is for these reasons that Friends of the Earth's Nanotechnology Project has now become the Emerging Tech Project. In addition to continuing work on nanotechnology, we will begin working on other emerging technologies such as synthetic biology and geoengineering. This change is important for a number of reasons. It means that there will now be an environmental NGO in Australia actively working on these issues. It recognises that many of these technologies are converging in disturbing and risky ways. And it enables us to look more broadly at the structural, political and commercial drivers that these technologies have in common.

This is critical. These new technologies have unprecedented global reach and potential impacts at a time when the unwillingness of governments to regulate is also unprecedented. If we don't deal with the structural failings that underpin the manner in which technologies are being developed and rolled out, we will fail to affect the kind of change that is needed.

The Emerging Tech Project will articulate, expose and we hope change the current trajectory that these technologies are on.

This edition of Chain Reaction is in part the beginning of that process. It contains articles from academics, thinkers and activists from all over the world examining emerging technologies in the context of corporate influence over both science and governments.

The first part of Chain Reaction explains two of the most worrying emerging technologies – synthetic biology (Jim Thomas) and geoengineering (Clive Hamilton). These technologies are then placed in the context of a history of failures by governments to respond to clear and early warnings of risks associated with a number of technologies (Steffen Foss Hansen). Hansen's piece demonstrates that there are very few cases where precaution resulted in regulation of non-existent risks, a claim often made by industry and governments.

Part 2 explores the corruption of science.

Beginning in the 1980s, the ALP began the process of privatising science – a process that has continued to the present. This includes reducing public funding of science; promoting private partnerships with universities; further strengthening the IP system; commodifying knowledge and encouraging entrepreneurial universities and staff.

As Philip Mirowski documents in his 2011 book *Science Mart*, these steps amongst others have resulted in an unprecedented level of corporate control over science and technology at universities. That relationship is now deeply entrenched and utilises a host of mechanisms – including funding of universities, departments and research; public private partnerships; patents and other forms of IP; trade secret regulation; non-disclosure agreements and publication control; technology transfer agreements; hiring of academics as consultants; spin-off companies; and select access to materials.

Universities and scientists give a level of credibility to new technologies that corporate interests can't. They can insulate developments driven by commercial interests from public distrust. They provide respectability, a suggestion of care and safety in the development of the technology, and of objectivity that corporations can't achieve on their own.

At the same time, as Egilman and Bohme outline, there is a significant body of evidence that corporate funding can have major impacts on what research is conducted, how studies are undertaken, the analysis of data and the conclusions reached. As Tombs and Whyte explain, censorship and self-censorship also become naturalised by scientists as they embrace 'entrepreneurial' science.

CSIRO plant industries, for example, has entered into a number of 'strategic partnerships' with biotech companies. These agreements are secret and exempt from release under the Freedom of Information Act, so the only way we can evaluate the impacts of these relationships is to look at the outcomes. As Kath Wilson recounts, Plant Industries fired the only scientist in the department who was openly critical of genetically modified (GM) crops. Since entering into these relationships Plant Industries have been die-hard advocates for GM.

When one looks at the amount of corporate money pouring into elite universities, as Kristen Lyons does in her piece on the University of Queensland, the scale of the problem becomes clear. Whole industry funded departments are dedicated to developing commercial technologies – while the conflicts of interest and reputational risks are ignored.

Our article on #Crazytech takes a somewhat lighter look at the crazier ideas that technophiles are creating and promoting.

The corruption of science has occurred in Australia because successive governments have allowed it to happen. How corporate interests have corrupted government is addressed in Part 3.

Some of the measures are well known, such as campaign financing; the revolving doors between industry and government that Kath Wilson exposes; intense and frequent lobbying pressure; and Ministerial trips, dinners and speaking engagements at corporate functions. Mark Diesendorf outlines just how successful such techniques have been for the fossil fuel industry in limiting the growth of the renewable energy industry.

However, there are much deeper systemic problems with the way government regulates new technologies. These include the institutionalised belief that social progress is the same thing as continuous technological advancement; that it is somehow possible to achieve limitless growth; and that technology is neutral rather than being subject to the social, political and economic conditions in which it is developed and marketed. These deeply held beliefs have led to government viewing critical regulation to protect human health and the environment as 'red tape' and 'barriers to innovation'.

Tager highlights this in a case study of Food Standards Australia New Zealand (FSANZ), and shows an agency that appears to be acting on behalf of corporate interests rather than the public. Miller shows how governments seek to manipulate public opinion through public engagement processes rather than engaging in legitimate dialogue about how new technologies should form part of our future.

International mechanisms are also used to further corporate ends – including free trade agreements; agreements relating to the movement of capital and goods; secret tribunals to hear disputes between parties; and the elimination of tariffs that may protect workers or the environment. These international instruments can be used to override the legislation of individual countries. As Rimmer discusses, governments have allowed privately held patents to become a *de facto* form of 'governance' of geoengineering.

Finally there is a piece that looks at how techno-utopian narratives are used to further corporate objectives.

As we come to grips with the ways in which emerging technologies reflect deeper structural issues with privatised science, corporate immunity from regulation and government failure to represent the public interest, we can begin to grapple with ways to change these structures.

There are no simple solutions, but there are solutions.

One of the first and critical steps in reversing these trends within emerging technologies is for greater public engagement in these issues. And so, this edition of Chain Reaction is both an expose of a problem that needs far more serious treatment than it has received to date, but also an invitation to you to help find and implement these solutions.

Jeremy Tager and Louise Sales are campaigners with Friends of the Earth's Emerging Tech Project. For more information visit: www.emergingtech.foe.org.au

Late Lessons from Early Warnings: Is it impossible to learn from history?

Steffen Foss Hansen

It seems we have lost the ability to learn from our past mistakes when it comes to protecting the environment and health. This is the depressing conclusion from the report *Late Lessons from Early Warnings: Precaution, Science, Innovation* published by the European Environment Agency (EEA) last year.

Learning from past mistakes in order to avoid repeating them is something that we normally associate with human intelligence. However, when it comes to regulating the environment and health risks associated with emerging technologies such as nanotechnology, biotechnology and geoengineering, we make the same mistakes again and again.

In 2001, the EEA published the report *Late Lessons from Early Warnings: The Precautionary Principle 1896-2000.* This examined 14 historical cases where decision-makers did not apply the precautionary principle and ignored early warnings of hazards. Cases included asbestos, PCBs and ozone depletion. In brief, the precautionary principle commits decision-makers and regulatory authorities not to use scientific uncertainty as a reason for not implementing regulatory and mitigation measures.

The conclusion of the EEA report was that decision-makers had ignored, not just early warnings, but also "serious and late" warnings and that this failure to act had been both very costly financially and had resulted in many unpredictable environmental and health consequences. The authors summarised their recommendations in 12 'Late Lessons' that future decision-makers should bear in mind:

1. Respond to uncertainty
2. Provide long-term monitoring
3. Addresses gaps in knowledge
4. Reduce interdisciplinary obstacles to learning
5. Ensure that real world conditions are adequately accounted for
6. Review the alleged benefits / risks critically
7. Evaluate alternatives
8. Ensure use of 'lay' and local knowledge
9. Take account of the assumptions and values of different social groups
10. Maintain regulatory independence
11. Reduce institutional barriers to learning and action
12. Avoid "paralysis-by-analysis"

In February 2013, the EEA published the long-awaited follow-up to its first report. As with their 2001 report, the report examines a series of case studies such as lead in petrol, mercury pollution in Minamata Bay, bisphenol A, floods and climate change with the sole purpose of learning from them. The second volume also includes a review of four new potential risk areas, including GMOs and nanotechnology, and there is a treatment of various cross-cutting themes such as a) the economic costs of doing nothing, b) the precautionary principle and over-regulation, c) risk governance, d) progressive business and e) the possibility of compensation for victims and protection of 'early warning' scientists.

The Agency's second *Late Lessons* report clearly shows that there are few historical cases of overregulation when it comes to the protection of human health and the environment. It identifies the pressing need to rethink risk assessment to better protect health and the environment and for more funding for environment and health research. The report also notes that, contrary to conventional perception, preventive measures do not strangle innovation, but to an extent lead to innovation both by industry and regulatory agencies. In addition, it is clear from the EEA report that market mechanisms need to factor in the environmental and health costs caused by activities and products. Lastly, it is important to promote cooperation between business, government and citizens in order to protect the environment and health and innovation.

The precautionary principle and risk of overregulation

Most of the case studies discussed in the EEA reports are cases where the regulatory authorities failed to apply the precautionary principle and ignored early warnings of risks. In discussions of the precautionary principle, you often hear the argument that public fears are unwarranted and that the widespread application of the principle will lead to overregulation of small or non-existent risks.

In order to investigate whether overregulation is something we should be concerned about, we reviewed the scientific and semi-scientific literature for cases where government regulation was implemented with reference to precaution and where the implemented regulation later proved to be unnecessary.

In total, we identified 88 cases which have been cited as examples of overregulation. After further analysis, it appeared that most of these 88 cases were either real risks, such as climate change, or cases where it is still being deliberated whether there is a real risk. After scrutinising the scientific literature on each of the 88 claimed cases of overregulation, we identified only four cases where regulatory actions were taken to address a risk which later turned out not to be real. The cost of overregulation in these cases appears to have been primarily economic. Our analysis demonstrates that fear of overregulation is excessive and should not be used as a reason not to implement risk reducing measures.

Overregulation does not seem to happen very often – especially when compared to the number and frequency of cases in which we have failed to apply the precautionary principle. There is a need for new approaches to characterise and prevent complex risks and to move the debate from being problem to solution-oriented.

The vital role of research in environmental and health protection

There seems little doubt that the needs of academic researchers differ significantly from the needs of regulatory bodies. As Philippe Grandjean and his co-authors point out in their chapter of *Late Lessons*, a large part of academic research is focused on a small number of well-studied environmental chemicals, such as metals. Research into potential hazards and emerging risks on the other hand appear to be very limited. The choice of research topics should better follow the societal need for knowledge on poorly known and potentially dangerous risks; and research should complement and expand the current knowledge – rather than repeating and validating existing knowledge.

Research is always influenced by scientific uncertainty, and many of these uncertainties mask a real link between an environmental hazard and its negative effects. This results in an underestimated risk and a failure to implement an appropriate intervention.

The precautionary principle and emerging technologies

We hear everyday about new and innovative technologies such as nanotechnology. Many current and future applications of nanotechnology are expected to generate significant social and environmental benefits. But a key question is whether we have learned from past mistakes when it comes to nanotechnology or whether we are about to repeat them?

The chapter on nanotechnology in the second *Late Lessons from Early Warnings* discusses the extent to which the twelve 'Lessons Learned' summarised above, have been implemented or properly addressed when it comes to nanotechnology.

It turns out that policy makers have not yet addressed many of the shortcomings in the current legislation and risk assessment methodologies, which in turn threatens to stifle the ability of society to ensure the responsible development of nanotechnology.

The economic costs of doing nothing

Mikael Skou Andersen and David Owain Clubb start their chapter on 'Understanding and accounting for the costs of inaction' by noting that the current political decision making process sees politicians respond to early warning signals of environmental hazards only after the costs of inaction have been estimated. Through a series of case studies, the two writers show how early warning signals can provide a basis for estimating the costs of inaction, when the science is less consolidated. For example, in the phase-out of ozone-depleting substances, it turns out that global warming actually makes the cost of doing nothing significantly higher than originally thought. This is a reminder that the figures for the costs of inaction have often been grossly underestimated in the past. Therefore, the cost estimates should not be left to economists alone, but rather be seen as a starting point for a broader discussion between people with relevant expertise in health, ecology, demography, modeling and science.

Will we learn the lessons?

Although Kundzewitz discusses the problem of floods in his chapter in the second *Late Lessons*, his account of what seems to be illogical cycles of repeated human error is generally applicable. Typically, it seems that a destructive event such as a major flood generates widespread enthusiasm for strengthening various emergency response systems and to initiate research and implement long-term monitoring. For example, after a flood, the relevant authorities often prepare ambitious plans. After some time without problems, the willingness to focus on and initiate mitigation research and long-term monitoring projects is scaled down or suspended. When the next flood occurs, a new cycle starts. This seems to be a general tendency for many of the cases that the European Environment Agency's authors write about.

With the release of the second *Late Lessons* report, one might hope that we begin to learn from our past mistakes and that we can now combine the precautionary principle with our knowledge of complex environmental and health risks so that there will never be a need to write a third volume in the series *Late Lessons from Early Warnings*.

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The New Sorcerer's Apprentices?

Clive Hamilton

Climate scientists have watched with mounting alarm as carbon dioxide concentrations have increased relentlessly. The anxiety has deepened each year as it has become clearer that the range of emissions paths mapped out by experts in the 1990s and early 2000s were unduly optimistic. The actual growth in emissions - boosted by explosive growth in China - is worse than the worst-case scenario.

Alarm has spread to staid organisations, with the World Bank warning last year that "we're on track for a 4°C warmer world marked by extreme heat-waves, declining global food stocks, loss of ecosystems and biodiversity, and life-threatening sea level rise."

At the same time, climate scientists have began to focus on the dangers of feedback effects in the climate system, that is, processes that amplify or dampen the direct warming effect of rising greenhouse gas emissions. For example, as warming melts the Arctic ice-cap the exposed water is darker than the highly reflective ice it replaces and so absorbs more heat from the sun. The melting of sea ice this past northern summer set new records.

Against this background, climate scientists have warned of a potential massive methane release due to rapid melting of permafrost, the collapse of the West Antarctic ice sheet, or rapid dieback of the Amazon forests.

Any of these could quickly shift the global climate into a new state, and there would be no way of recovering the situation. How, they asked, could we intervene to prevent these things happening? If Plan A, persuading the world to cut emissions, is failing, shouldn't we have a Plan B?

And so in the last few years research into various schemes to engineer the climate has been accelerating.

Geoengineering technologies

Geoengineering is any deliberate, large-scale intervention in the climate system designed to counter global warming or offset some of its effects. More than 40 schemes have been put forward, with some the subject of intensive research (see box for some of the main ones).

The two most touted schemes are ocean iron fertilisation and sulphate aerosol spraying.

The deep ocean has the capacity to absorb large amounts of carbon dioxide from the atmosphere, and it would help if we could get more carbon down there and hope that it stays.

But how do we get carbon to the deep ocean? The answer lies in what is known as the biological pump. Tiny marine plants known as phytoplankton grow by combining carbon dioxide, various minerals and sunlight to multiply into blooms. On death, gravity causes the plankton to sink.

The effectiveness of the biological pump depends on the suitability of conditions for marine life, including the availability of micronutrients, especially iron. If a shortage of iron is limiting plankton growth in an area of ocean then perhaps the artificial addition of the missing ingredient can stimulate algal blooms.

Fertilising some areas of ocean with iron slurry does indeed induce algal blooms. But it turns out that much of the carbon fixed in the phytoplankton does not find its way to the ocean floor but circulates in the surface waters, feeding the food chain, before being emitted as carbon dioxide back into the atmosphere.

And while iron fertilisation stimulates biological productivity in one area, nutrient stealing can see it fall in others. As one expert said: "you might make some of the ocean greener by iron enrichment, but you're going to make a lot of the ocean bluer".

It's been estimated that a massive fertilisation effort over 100 years could absorb perhaps 3 per cent of cumulative emissions from burning fossil fuels over the same period. In the meantime, ocean acidification and temperatures

would reach a level at which algal populations would be severely reduced.

Another geoengineering proposal is sulphate aerosol injection. This would involve spraying sulphur dioxide or sulphuric acid into the upper atmosphere to form tiny particles that would reflect an extra one or two per cent of incoming solar radiation back into space, thereby cooling the planet.

This could be delivered by a fleet of customized high-flying aircraft fitted with tanks and spraying equipment, although a hose suspended in the sky is also being investigated. In effect, humans would be installing a radiative shield between the Earth and the Sun, one that could be adjusted by those who control it to regulate the temperature of the planet.

How effective would such a solar filter be in suppressing warming? All the models indicate that if we reduced the amount of sunlight reaching the planet the Earth would indeed cool fairly quickly and evenly, although with less effect at the poles. The models also show that rainfall would be returned some way towards pre-warming patterns. Crucially, the solar shield would do nothing to offset the acidification of the oceans due to carbon emissions.

However, other atmospheric scientists argue that the complexity of the climate system means that it is impossible to draw any firm conclusions about the consequences of such a radical intervention in the Earth system. And it is thought that injecting enough sulphur to offset human-induced warming would delay the recovery of the Antarctic ozone hole by 30 to 70 years.

Other studies indicate that the Indian monsoon could be seriously disrupted, affecting food supplies for up to two billion people, although the disruption may be less than in a scenario of warming without the solar filter.

One problem with sulphate aerosol spraying—described as the "killer objection" - is that we can only get a good idea of how it would work by full-scale implementation. Even then we would need at least 10 years of global climate data before we knew it was working or not.

To compound the risks, if after 10 years, when we accumulated enough data to decide that our intervention was not a good idea it may be impossible to terminate the solar shield. Why should this be so?

According to one study, if sulphate aerosol spraying began in 2020 and had to be stopped after 40 years, we would see a surge in average temperature by a scorching 1.3ºC in the first decade, falling back to 0.33ºC in the following decade. Yet it's estimated that if warming occurs at a rate of 0.3ºC per decade only 30 per cent of ecosystems can adapt. So once deployed it is likely that we would become dependent on our solar filter, the more so if we failed to take the opportunity while it was in place to cut greenhouse gas emissions sharply.

The geo-lobby

A constituency advocating investment in a major research program has now emerged, and is gaining influence. Bill Gates has commited several million dollars to finance research into geoengineering and is now an investor in various geoengineering enterprises.

Richard Branson is also promoting geoengineering as a response to climate change. Oil companies, anticipating a shift in the political landscape, are quietly backing research into geoengineering.

The idea of geoengineering as a response to climate change has gathered enough momentum for it to be included in the latest assessment of the Intergovernmental Panel on Climate Change. Although the IPCC report takes a skeptical view of solar radiation management it has effectively endorsed some forms of carbon dioxide removal. By including geoengineering it has legitimised it.

In recent years there has been a flurry of patents taken out over methods to engineer the climate. One of them is so broad that, if enforceable, it would place fertilization of the oceans in the hands of one man.

Burgeoning commercial engagement in geoengineering is creating a constituency with an interest in more research and, eventually, deployment. Such a lobby is naturally predisposed to argue that pursuing emission cuts is 'unrealistic' or 'politically impossible' and therefore geoengineering is the sensible alternative. This is the slippery slope concern about researching geoengineering.

All of which points to perhaps the greatest risk of research into geoengineering—it will erode the incentive to cut emissions. In a political and commercial environment where cutting emissions appears too hard, geoengineering arrives as the next great white hope. Which government would not be enticed by the technofix to beat all technofixes? No need to take on powerful fossil fuel companies, no need to tax petrol and electricity, no need to ask consumers to change their lifestyles. And instead of global warming being proof of human failure, geoengineering could be the triumph of human ingenuity.

Two types of geoengineering technology

Carbon dioxide removal

Air capture – extracting CO_2 directly from the air using metal boxes or 'sodium trees'. The captured CO_2 then has to be concentrated and piped to a burial site underground, if one can be found.

Biochar – when heated without oxygen plant material turns into charcoal. This biochar, with its trapped carbon, can be spread on the soil and last for decades – even centuries.

Liming the oceans – oceans absorb some of the CO_2 from the air, but the extra CO_2 also makes them more acidic. Adding lime would offset the acidification allowing more CO_2 to be soaked up.

Solar radiation management

Painting roofs white – it works but there are not enough roofs to make a difference.

Space mirrors – millions of small ones could be oriented to reflect sunlight away from Earth, but it's still science fiction.

Marine cloud brightening – a serious proposal involving a fleet of special ships spraying micro-droplets of water into the air to aid the formation of low-lying marine clouds that reflect some sunlight back into space.

The brave new world of synbio

Jim Thomas

Here's a thought experiment: what if living things were actually machines? What if they were the sort of machines that you could take apart, reprogram, and hack to do something entirely new? Plants that glowed like light bulbs? Yeast that produced vanilla? Bacteria that took photographs? The biotechnology industry has spent years trying to think that way and it's the impetus to a rapidly exploding industry called synthetic biology.

Of course living things are not machines – a bacteria or a yeast is a complex evolving organism that's as different from a machine as a skyscraper is from a cloud. But the field of synthetic biology, which attempts to bring orderly engineering principles to the messy stuff of life, nonetheless tries to re-characterise living organisms that way:

For a start a living organism has a body or a cell – what the biological engineers like to call a 'chassis' and it also has 'instructions' in the DNA of the cell that look suspiciously like a 'code'. The DNA 'code' for a living cell is made up of 4 chemical letters G,T,C and A and the arrangement of those letters, like the arrangement of computer code in software, helps determine how a cell grows and what goes on inside the cell – whether it produces ink or vanilla or a protein that glows green. Now imagine, so the thinking goes, if you could just 'reprogram' that 'code' so that the 'chassis' cell does something commercially interesting - then you could imagine profitable uses for these 'biological machines'. The cell can be 're-programmed' as a tiny biological 'factory' that can pump out any chemical you desire. Scaling up to millions of those 'programmed cell factories' (because they are self-replicating 'machines' and you can hold them in a big industrial vat) then you effectively have a new way to make the stuff our consumer societies rely on: plastics, fragrances, food ingredients, cosmetics, fuels, medicines etc. Welcome to the incredible vision behind synthetic biology (or synbio) – the applied re-engineering of life to serve industrial production purposes.

It may all sound a bit sci fi – but synthetic biology is in fact a multi-billion dollar industry with products already in the market place. Around a hundred synbio companies have deals with some of the largest chemical, food, energy and cosmetics companies on the planet. Those pushing forward the field are household names: from Exxon, BP and Shell to Du Pont, Unilever and Proctor and Gamble. According to synbio companies their products are already in soft drinks, soaps, face creams and washing detergents – unregulated, unlabelled and under the radar of public awareness.

It may also sound all a bit reminiscent of genetic engineering and in fact synbio is often dubbed 'extreme genetic engineering' – the difference being that the field of manipulating life has come a long way since scientists first started splicing and dicing genes back in the early 1970's. It used to be necessary for genetic engineers to find sections of DNA code in nature, cut them out of existing organisms, and insert them into a host organism in a 'cut-and paste' process. Today synthetic biologists use a DNA printer –called a DNA synthesiser. This can build DNA molecules from scratch and therefore arrange the chemical code any way they choose. This means the instructions for an engineered living organism can be entirely novel. You don't need to find the code that tells a yeast to glow green. Instead you just write it yourself with computer software. Indeed it is possible to synthetically construct all of the DNA of a living organism as Craig Venter did in 2011 when he unveiled a microbe, nicknamed Synthia, whose full set of DNA had been artificially printed out by a machine – what he called the first living organism whose parent was a computer.

Today most synthetic biology companies are printing out 'genetic programs' for microbes such as yeast or algae that in turn hijack the functioning of the living cell forcing it to produce an industrially useful compound. For example Evolva, a Swiss-American synthetic biology company has re-engineered yeast to make the key compounds from the spice saffron, which happens to be the worlds most expensive spice. Saffron is usually picked from crocus flowers in Iran but Evolva can now brew it in a large vat of engineered yeast in much the same way beer or wine is made. Another synbio yeast developed by Evolva will produce vanillin – vanilla flavour but without a vanilla plant being needed. Yet another yeast synthetically engineered by Evolva makes sweetening compounds from the South American stevia plant, ready for diet soda drinks – but with no stevia leaves anywhere in sight. Because the ingredients are made in a 'brewing' process the companies believe they can label them as 'natural' - pitting the synbio compounds directly against botanically-sourced equivalents.

This prospect of lab-grown food and consumer ingredients may be a boon to the 22 billion dollar flavour and fragrance industry but, especially with false 'natural' claims, is reason enough for tropical farmers to become alarmed. Every hectare of natural saffron growing in Iran provides jobs for up to 270 people per day (In Iran saffron is the third most important export crop after petroleum and pistachios). Lab-grown saffron threatens those jobs.

An estimated 200,000 people grow, tend and cure vanilla beans in Madagascar, Comoros, Reunion, Mexico, Uganda and elsewhere. Such farmers already have precarious livelihoods and have suffered because of the success of chemically synthetic vanilla. Not only are livelihoods threatened by synbio vanillin but also the ecosystems with which these lives are entwined. Vanilla farming is closely tied to rainforest protection because the fickle natural vines require intact forests to thrive. When the price of vanilla crashes Madagascan vanilla farmers are often forced to hack away the forest to plant rice on eroding hillsides. Another synthetic biology ingredient now entering the market, synbio vetiver oil for fragrances, stands to directly displace natural vetiver grass grown by 60,000 farmers from Haiti – some of the poorest farmers in the western hemisphere. Vetiver may provide close to half of Haiti's agricultural export income. It's also an excellent guard against soil erosion. Once again livelihoods and conservation will both suffer from the commercialisation of synthetic biology.

Of course the emerging synthetic biology industry can't do away with farmers altogether. Vats of engineered yeast or algae require vast quantities of sugar that is in turn sourced from monoculture industrial corn or sugarcane plantations. To date all the largest synbio companies have set up manufacturing plants in Brazil, taking advantage of that country's expanding sugar plantings. Cane sugar may be sweet to eat but it has a very bitter side too – water hungry, chemical laden and often harvested by slave labour, sugar cane expansion is driving destruction of Brazil's precious Cerrado region, home to 5% of earth's biodiversity. Sugar cane expansion is also pushing back the agricultural frontier - driving soy and cattle farming deeper into what used to be the Amazon rainforest.

And then of course there's the hot button question of safety. Old-fashioned genetic engineering has faced 40 years of global controversy because of the unexpected and unpredictable side-effects of mucking around with the genetic code. synthetic biology only intensifies the uncertainties. Synthetic biology techniques create highly novel sequences of genetic code that are often designed inside a computer but then unleashed in a living organism. How that synthetically modified organism will grow, adapt, behave and change over time is at best speculation since synthetic biologists have so far failed to develop agreed protocols for assessing their artificial creations.

Some unpleasant scenarios are easier to imagine than others. What if an algae engineered to produce gasoline (this has been done) escapes and starts to reproduce in rivers, streams and oceans? In this case the escaped organism may be a living oil slick. If the engineered organism produces patchouli or vanilla the living pollution may smell nicer but the ecological effects could still be significant.

The uncertainty of how to even assess synthetically modified organisms has so far led the emerging industry to claim that they can keep their creations contained but now a new wave of synbio organisms are being developed that are intended for environmental release. In April 2013 a group of 'bio-hackers' from California used the social media fund-raising website Kickstarter to raise almost half a million dollars to commercialise a synthetic biology plant that glows in the dark. In exchange for seed funding the 'glowing plant project; promised to send 100's of thousands of bioengineered seeds to over 6000 random individuals across North America – in effect a large unregulated release of a synthetic organism. Because the technology is so new the US Department of Agriculture has declared itself unable to regulate it and despite vocal opposition from ecologists the Glowing Plant company will start mailing out its synbio plants in September 2014.

Meanwhile other synthetic biologists are proposing using live engineered algae in fracking fluids or as biopesticides on crops. At the crazier end, a few scientists are even proposing using synthetic biology to bring back extinct species (called de-extinction). The Revive and Restore foundation is working on de-extincting the north American passenger pigeon. Synthetic biologist George Church has speculated on bringing back the woolly mammoth and even Neanderthals. Such proposals verge on entertainment rather than serious science however they are attracting interest from NGO's who run zoo's, sensing perhaps the lucrative profits in displaying de-extincted animals to the public.

As the field of synthetic biology races ahead, regulators are very much lagging behind. This year the 193 countries of the UN Convention on Biological Diversity will belatedly begin to grapple with oversight of synthetic biology, facing calls from civil society for a moratorium on any commercial and environmental release. Already an international fight is brewing between a handful of rich countries who back the brave new synbio industry and those tropical nations whose farmers and forests stand to lose from the changes synthetic biology is about to unleash.

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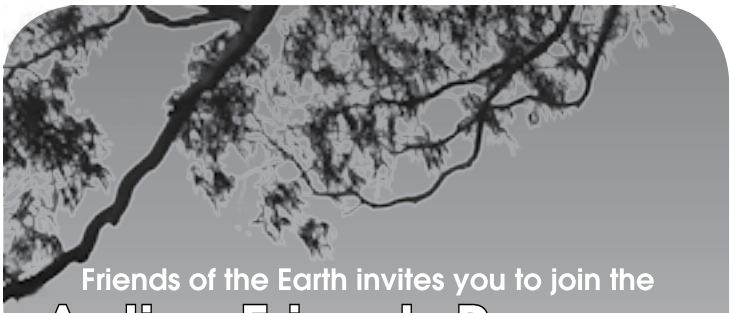

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Corporate corruption of science and its effects on workers and the environment

David S. Egilman and Susanna Rankin Bohme

Although occupational and environmental diseases are often viewed as isolated and unique failures of science, the government, or industry to protect the best interest of the public, they are in fact an outcome of a pervasive system of corporate priority setting, decision making, and influence. This system produces disease because political, economic, regulatory and ideological norms prioritise values of wealth and profit over human health and environmental well-being. Science is a key part of this system; there is a substantial tradition of manipulation of evidence, data, and analysis, ultimately designed to maintain favorable conditions for industry at both material and ideological levels.

To the extent that science is carried out by and for corporations, it becomes subject to the corporate logic of profit maximisation.

Corporations have much at stake when the safety of their products is put to scientific test, and spend hundreds of billions on research each year worldwide.[1] Industry-funded research takes place in a variety of formats and venues, including universities, corporate laboratories, and science-for-hire firms that conduct research for corporate clients.

The extent of corporate-funded science is troubling because history shows a substantial tradition of manipulation of evidence, data, and analysis, ultimately designed to maintain favorable conditions for industry, at both material and ideological levels.

Skip Spitzer[2] observes that corporations "largely ignore social and environmental costs," chiefly through externalising them, or shifting costs to governments, neighbors, or workers. As economist Robert Monks has put it, a corporation "tends to be more profitable to the extent it can make other people pay the bills for its impact on society."[3] For example, when a company emits air and water pollution, it externalises the costs of cleanup (or clean production), shifting expenses to the public who may get sick, be forced to pay for cleanup, or pay for damages in indirect ways. If a company can avoid paying these true costs of the manufacture and use of its products, its profits are enhanced and it has an economic advantage over its more socially responsible or regulated competitors. Since these costs are often large, they provide large incentives for companies to avoid them by influencing the regulatory process or by moving production to nations with less-effective regulatory regimes, often in the developing world.

The corporate practices that externalise occupational and environmental costs are countered by social standards for health and safety, embodied in national or international regulation and/or worker and consumer movements. To counter or prevent regulation and citizen movements and maintain their ability to maximise profit, corporations actively engage in the making of public opinion.

Science is a powerful tool in affecting social standards, and is often used by industry in hopes of influencing public and regulatory acceptance of a particular industry, process, or product. However, when science functions as a tool to affect public opinion or labor or environmental regulation, it does not function as a value-free arena of neutral inquiry, but is subject to influence by the corporate goal of profit maximisation. In any case, corporations use several strategies not only in the production of scientific studies that are favorable to them, but also in the communication of those studies to audiences that are important in public decision making, such as lawmakers and juries. While such communication is often not thought of as part of the scientific process *per se*, it is a key part of the corporate use of science. Corporate strategies in the production of science and the communication of science are interlinked, and are both extremely important to consider in a critical evaluation of the corporate corruption of science.

Corporate strategies for the production of science

By the "production" of science, we mean the processes involved in posing questions and making hypotheses, planning and carrying out studies, drawing conclusions from data, reviewing and analysing other scientists' work, and so on. This is essentially the day-to-day work of toxicologists, epidemiologists, physicians, and basic scientists (molecular biologists and others). Corporations may influence scientific production when they run their own development or toxicology laboratories, or when they pay universities or private firms to carry out research for them. This influence can be seen in subtle or overt ways. Sometimes, reasonable, honest, and competent scientists can differ, and corporations will fund, utilise, or depend on the science that is more favorable to their products, often because it seems the most "reasonable" to them.

Kjaergard and Als-Neilsen[4] and Als-Neilson *et al.*[5] found that of scientists conducting randomised clinical trials of therapeutic interventions, those with corporate funding

'In order for science to help ensure a favorable climate for corporate profit maximisation, it must influence public opinion.'

were significantly more likely to favour the intervention than researchers without such funding. As Sheldon Krimsky has shown, universities and university scientists are increasingly involved in venture capital enterprises based on scientific research and development, leaving both institution and individual with deep conflicts of interest.[6] Sometimes, deeply embedded beliefs about a material's or an industry's safety leads to scientific bias.[7] Other times, though, scientists and others consciously use faulty science to craft a rationale for a minimum level of health and environmental protections.

Perhaps the easiest way to downplay the negative health impact of a dangerous substance is to simply fail to publish studies that demonstrate that impact. For example, Jock McColloch describes how the Canadian asbestos industry failed to publish their data that showed Quebec asbestos miners incurred high rates of asbestosis and other health problems.[8] In fact, Canadian asbestos companies publicly claimed for decades that Canadian miners did not suffer from asbestosis. It is the industry's careful "management of medical knowledge," writes McColloch, that "has been the key to the continued use of asbestos."

While McCulloch demonstrates the manipulation of science within particular industries, these strategies are in fact used again and again to manufacture a clean bill of health for hazardous products. Valerio Gennaro and Lorenzo Tomatis[9] describe a number of strategies corporate-funded epidemiologic studies can use that will "almost invariably lead to negative results." The authors present 15 strategies, including: the creation of a dilution effect by comparing all workers with an unexposed control group instead of comparing exposed with unexposed workers; failing to control for the healthy-worker effect; considering exposure to only one substance; and failing to build in adequate follow-up periods when studying diseases (such as cancer) with long latency periods.

Corporate strategies for the communication of science

In order for science to help ensure a favorable climate for corporate profit maximisation, it must influence public opinion. Corporate science is often undertaken with an essentially political purpose: to minimise regulation and influence the beliefs of workers, consumers, and jury members.

Regulation at the national level is often the main obstacle to the externalisation of corporate profits. The regulatory apparatus can require industry to dispose of waste safely, limit worker exposures to toxins, and ensure that consumer products are safe, among other things. In the United States, there has been a movement against regulation since at least the mid-1970s. Business interests have successfully argued that regulation costs jobs, stunts innovation, and harms the economy. Using targeted campaign contributions, focused lobbying, and other tactics, US corporations exert considerable influence on the regulatory process. Due to the economic and political power of the US, this under-regulation puts enormous pressure on other countries to do likewise.

Jennifer Sass's[10] and Peter Infante's[11] commentaries on butadiene regulation at the US EPA and Occupational Safety and Health Administration (OSHA) demonstrate the techniques industry uses to influence regulation, and the success of those techniques in the US regulatory sphere. Sass shows problems with industry influence on butadiene scientific panels at both the EPA and the International Agency for Research on Cancer (IARC). At EPA, an industry-heavy science advisory board (SAB) persuaded the EPA to base its estimate of butadiene cancer potency on a weak study that lacked individual exposure data, was likely to have misclassified exposure levels, and counted only deaths from leukemia, not living leukemia cases. At the IARC, a vote to classify 1,3-butadiene as a human carcinogen was reversed in an extraordinary second vote that reclassified the chemical as a "probable human carcinogen."

Peter Infante[12] shows how a similar reclassification took place at OSHA, where, despite clear evidence of elevated rates of lymphohematopoietic cancer due to workplace benzene exposure, the agency declined to pass a more stringent standard on its own, but rather arranged for industry and labor representatives to come to an agreement on the standard. While industry agreed to the OSHA-suggested standard, industry representatives also convinced the agency to downgrade the classification of butadiene to a "probable human carcinogen" rather than a "human carcinogen." The end result was a classification based on negotiation rather than science; and one that could wrongly assuage workers' fears and negatively affect workers applying for compensation for lymphohematopoietic cancer.

"You are completely free to carry out whatever research you want, so long as you come to these conclusions."

On an international level, free-trade agreements negotiated through the World Trade Organisation (WTO), bilateral agreements such as NAFTA, and the structural adjustment programs imposed on many developing countries by the World Bank and the International Monetary Fund (IMF) have sometimes militated against national labor and environmental regulation. Free-trade agreements can also mean that national health, safety, and environmental regulations characterised as restrictive of trade can open national governments to expensive suits under agreements such as NAFTA, which can have a chilling effect on regulation in general.[13] The current export-oriented development model has also meant that there is immense pressure on nations to deregulate; multinational corporations have their pick of nations in which to invest or manufacture, and can choose the nation with the least restrictive rules. A weaker regulatory environment often translates into expanded profit margin, but has not been accompanied by rising standards of living for people in most cases.[14]

While the regulatory apparatus is a key target for corporations interested in defending the safety or healthfulness of their product, industry also works to convince a much larger group of people of the safety of their products. This group includes workers, consumers, and jury members.

The opinions on health and environment related matters of many jury members, consumers, and workers are not formed through the consideration of scientific data or materials per se, but rather through the myriad ways that information is received by them in their day-to-day life. People receive knowledge about health and hazards from a variety of sources. For corporations engaged in the production of harmful substances, using those sources to influence public knowledge is key to maintaining profitability and protecting against legal losses.

Michael Jacobson shows one way corporate entities spread their message of safety.[15] Many trusted and well-known organisations, such as the American Heart Association, which are widely perceived as providing or disseminating objective scientific information, are substantially supported by corporate groups. Jacobson shows how professional organisations, university research institutes, health charities, and other nonprofit groups that receive corporate funding may be limited or influenced by their corporate sponsors; and how some organisations that seem independent are in fact created and controlled by industry. We note that this corporate strategy extends to the international sphere: as Nicholas Ashford *et al.* have shown, the International Commission on Occupational Health, which bills itself as an "international non-governmental professional society whose aims are to foster the scientific progress, knowledge

'We must act as citizens to pass reforms that hold corporations and corporate-funded scientists accountable for the quality of their work.'

and development of occupational health and safety in all its aspects," is in fact dominated by multinational corporate interests.[16] ICOH has sought to strengthen its ties with international bodies such as the ILO and the WHO in order to influence international health guidelines and policy, but has failed to be up front about the fact that most of its members represent the interests of industry.

Corporate campaigns to influence public opinion may not address the health effects of a product or process per se, but may work to make that product or process seem indispensable to protect jobs, maintain an adequate standard of living, or achieve some other social or economic good. For example, Monsanto has used a variety of strategies to claim that its products (first pesticides and then genetically-modified foods) are not only safe, but beneficial to both the environment and economic growth, while at the same time foreclosing critiques of these technologies as dangerous and environmentally unsound.[17]

Solutions

We believe the problems of the corporate corruption of science must be addressed not only at the material level, but at the ideological level as well. To many, corporate power now seems natural and beneficial. The dubbing of economic neoliberalism as "free trade," for example, sums up a whole set of benefits the economic model is supposed to provide, while obscuring the negative social, cultural, and economic aspects of the neoliberal program, which in fact has resulted in increasing inequality both within individual nations and on regional and global levels.[18]

In the face of the power of corporate capitalism to define itself in positive terms, we must work on constraining corporate abuses while developing a new way of thinking about the role of the corporation. We must act as citizens to pass reforms that hold corporations and corporate-funded scientists accountable for the quality of their work. We should support funding for research on key areas in occupational and environmental health that are not being addressed by status quo science. And we should work with schools and community groups to foster scientifically-literate citizen action for healthier workplaces, communities, and natural environments. Finally, we should work across borders, building a global network to address shared occupational and environmental health harms from both an activist and a scientific perspective.

The corporate corruption of science is a real threat to the health and well-being of people and the environment the world over. Such a problem deserves a concerted response.

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#CrazyTech

Welcome to #CrazyTech, a list of some of the newest idiotic, dangerous, delusional and just plain crazy technologies. We are approaching the list with a light-hearted spirit of ridicule and contempt – but in reality, we find the thought of most of these technologies quite terrifying.

Don't get us wrong – we're not saying new technologies are bad. We're saying they should be safe, effective and meet genuine public need – not be driven by corporations to maximise profit. The research and development of new technologies should be open to public debate and the entire life cycle of the technology considered – not just the use.

We're opening up this Pandora's Box of crazy technologies with a Top Ten list. But with crazy new technologies constantly emerging, we can't spot them all. So we'd love your help. You can use #crazytech on twitter, and email us with examples of the latest crazy technology so we can post it to the #crazytech list on our new Emerging Technologies Project website (emergingtech.foe.org.au).

1. Glow in the dark synbio plants

In April 2013 a group of 'bio-hackers' from California used the social media fund-raising website Kickstarter to raise almost half a million dollars to commercialise a synthetic biology plant that glows in the dark. In exchange for seed funding the glowing plant project promised to send 100's of thousands of bioengineered seeds to over 6000 random individuals across North America – in effect a large unregulated release of a synthetic organism. Because the technology is so new the US Department of Agriculture has declared itself unable to regulate it and despite vocal opposition from ecologists the Glowing Plant company will start mailing out its synbio plants in September 2014. Of course we have no way of knowing the impacts these synthetic organisms will have on the environment and the project sets a dangerous precedent when it comes to the uncontrolled release of synthetic organisms.

On their Etsy store website[1] the Glowing Plant team state: "Show your friends you care about sustainability and help inspire others about the potential of synthetic biology to make the world a better place." Huh?

2. Nano-silver socks

Socks impregnated with nano-silver promise their antibacterial properties will eliminate unpleasant foot odour. Brilliant! That is, until we consider the significant consequences that the use of nano-silver may have on human health and the environment.

Nano-silver is used in a wide range of socks, undies, shirts and much, much more to kill microbes. The majority of the nano-silver will be washed down the drain after 3 washes and once leaked from a garment, nano-silver ends up in the environment and you're back at stinky-foot-square one. Not only that but studies have shown nano-silver is highly toxic to aquatic organisms – causing zebrafish to develop with head deformations and no eyes.

Most nano-silver winds up in sewage sludge which is applied to agricultural land where it has been found to disrupt nitrogen-fixing bacteria in soil, posing a potentially catastrophic threat to global food production. Scientists have also warned that the widespread use of nano-silver will encourage the development of antimicrobial (antibiotic) resistant bacteria, recently described by the WHO as a "major global threat" to public health. These potentially catastrophic side effects raise the question – are these socks really worth the risk?

3. Spraying sulphate aerosols into atmosphere

Helplessness and hopelessness can drive you to insanity. The paralysis brought about by human inaction on climate change has led to some crazy ideas and suggestions – most notably geoengineering – the large-scale manipulation of the planetary environment to counteract climate change. Geoengineering ideas include seeding blooms of ocean algae with iron nanoparticles; reflecting the sun's warming rays back into space with lots of tiny mirrors; and covering the Sahara desert with trees. But at the top of this list of insane ideas must surely be the spraying of sulphate aerosols into the upper atmosphere to reflect sunlight back into space –sometimes referred to as global dimming.

One of the most vocal advocates of this idea is Harvard University physicist David Keith, who calls it "a cheap tool that could green the world." Keith suggests we start with a fleet of just ten jet planes injecting sulphates into the atmosphere, which would then rise to a fleet of hundreds of planes, before carbon emissions started to fall. Other suggestions include using artillery, balloons and giant chimneys to get the particles sky high.

But the stakes couldn't be higher. The only 'scientific experiments' big enough to test these ideas would have to be large enough to potentially affect the entire planet, risking uncontrollable outcomes. What's more, a recent study in *Nature Communications* suggests all major geoengineering proposals will be largely ineffective, with unintended and potentially unstoppable consequences.

Despite this, there is a real threat that some governments and scientists will push ahead with geoengineering, irrespective of a lack of global consensus. The fact geoengineering is still being considered at all suggests we have already experienced the global dimming of some scientists… deluded into thinking they can control the climate.

4. Synthetic yeast

The recent announcement of the creation of the first synthetic yeast chromosome sent shockwaves through the scientific community. Scientists claim this and other applications of synthetic biology will allow us to understand lots more about how our own human cells function. However, we can be certain that biotechnology corporations will steer these new technologies towards anything which will potentially create profit, ignoring any potential long-term adverse consequences.

The researchers have been deliberately trying to engineer a synthetic yeast which can outcompete wild yeast. What's more, microorganisms are renowned for their ability to swap genes – meaning that the synthetic DNA may not be confined to the synthetic yeast for long. We only need to look to the ability of bacteria to swap and trade antimicrobial resistance genes when confronted with nano-silver or antibiotics.

Scientists have found that yeasts have a critical role in flowering plants – promoting root growth and establishing symbiosis with healthy soil mycorrhizae, and fermenting flower nectar to warm the flower, which enhances pollen germination and distribution by insects such as bees and wasps. The release of a synthetic yeast has the potential to not just purportedly improve beer, but also wreak havoc with the very basis of our natural systems – and our agricultural systems too.

Alarmingly, synthetic biology is not specifically regulated by any government in the world.

5. Carbon nanotubes in agriculture

Scientists have discovered that carbon nanotubes can boost plant growth if they are treated to be more soluble and are absorbed by plants. One research group has even produced 'bionic plants' by inserting carbon nanotubes into plant chloroplasts, suggesting that this may enhance photosynthesis. Carbon nanotubes have also been touted as potential directed delivery systems for pesticides, fertilisers, and other chemicals because of their ability to easily penetrate membranes like the cell walls of plants.

Sound good?? Er, no. Okay – so what's wrong with us giving plants a carbon boost? Well for a start, carbon nanotubes are highly toxic to aquatic life – including algae, fresh water fleas and some fish species, even at very low concentrations. They have anti-microbial properties – raising serious questions about their impacts on soil microorganisms. They are one of the *least* bio-degradable and *most* energy-intensive materials made by humans. They have been shown to migrate to the leaves and fruit of some plants – and some studies have raised concerns they may bioaccumulate. Oh, and mouse experiments suggests the inhalation of carbon nanotubes will cause severe lung disease and promote lung cancer. All in all, the idea of putting carbon nanotubes inside plants is surely a little shop of horrors…

6. Synthetic DNA

Life on Earth has relied on four DNA subunits – G, T, A and C – for billions of years.

However, US scientists have now created two new letters of the DNA alphabet 'X' and 'Y', encoded into living, breathing – and dividing – E. coli cells. Lead researcher Floyd Romesberg claims it's all perfectly safe, preferring to think "If you read a book that was written with four letters, you're not going to be able to tell many interesting stories. If you're given more letters, you can invent new words, you can find new ways to use those words and you can probably tell more interesting stories."[2] But will all of these "interesting" stories have happy endings?

For now, the new X/Y DNA does nothing. But what this new alien genetics does, is open up the potential possibility of creating new amino acids, proteins and enzymes – and new 'alien' life-forms, never before seen in nature – with new unpredictable outcomes. Here, the engineered

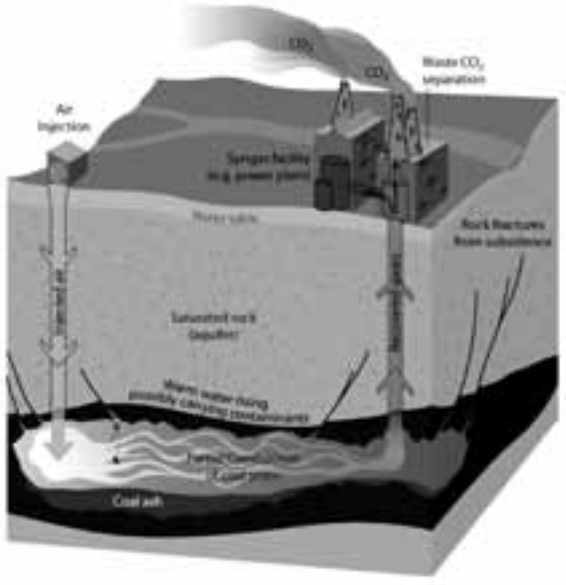
microbe – *E. coli* – is a human gut bacteria. So if something goes wrong, we humans will probably be amongst the first species on Earth to be affected.

One could argue that ethical questions about where to draw a line around how far synthetic biology research should go, and acceptable risks – have gone from "where to draw a line" to "whether anyone is going to bother to draw a line at all?"…

7. Underground coal gasification

As Governments around the world wrestle with the problem of how to urgently reduce our greenhouse gas emissions, some genius has just come up with an idea of how to create a whole lot more! Underground Coal Gasification (UCG) is a process where coal and gas reserves – previously deemed unreachable – are set alight underground and the emissions captured. Whilst not exactly new, pilot projects of this crazy technology have recently been promoted to create fuel or feedstock (called "Syngas") for a range of chemical products.

UCG is being sold on the basis that it saves time and money in mining, and prevents mines and waste dumps scarring the landscape. On the flip side, as the fire burns along the coal seam, the space created can lead to collapsing of the overlying geology making the land unstable and leading to groundwater contamination with shale gas and toxic by-products – as tragically revealed recently in Queensland.[3] Subsidence may also supply oxygen to underground fires, allowing the coal seams to burn indefinitely. Earlier this year, Australians witnessed the difficulties of extinguishing



the uncontrolled coal fire at Morwell mine. Imagine the added complexities of this situation underground, with unknown unknown escape pathways for released toxins.

In short, UCG is about as good an idea as using thalidomide to treat morning sickness.

8. Floating nuclear power plants

Floating nuclear power plants – perhaps not a string of words that you have come across before? And probably for a good reason – it makes no sense. Yet researchers looking into how to avoid repeating nuclear disasters, like the Fukushima meltdown in 2011, seem to think floating nuclear power plants (FNPP) are the solution to generating safe nuclear energy. By floating in open water, FNPPs are thought to be at lower risk of damage from tsunamis and earthquakes, and in the event of a nuclear meltdown "the ocean itself can be used as an infinite heat sink", claims Jacopo Buongiorno, a professor of nuclear science and engineering at MIT. The idea has gained supporters in America, Russia and Japan over recent years, however the advantages are yet to be proven.

Construction of the first ever FNPP is currently underway in Russia, intended to provide power for the expansion of Russia's oil-and-gas industry in remote areas, including the Arctic. But we've all given up on Arctic sea ice anyway, right? Oh, and in the event of radioactive material leaking from a FNPP meltdown, the pollution would not be limited to surrounding soil as it would be with a land based power plant. Instead being transported wherever the ocean currents took it – and potentially persisting in global waters for thousands of years. Genius.

9. The woolly mammoth project

Along with the Passenger pigeon, the thylacine and the dodo, new stories about the woolly mammoth just won't go away. You know – the one where they bring them back from extinction. Termed 'de-extinction', scientists are talking about taking the genomes of living species and editing, gene-by-gene, to re-create entire genomes.

Harvard University Professor George Church even claims that reanimating the woolly mammoth could "stave off some effects of warming" in the icy and grassy tundras of Russia and Canada![4] Meanwhile Stewart Brand from de-extinction organisation Revive & Restore cites "the pure thrill of the prospect of herds of mammoths bringing tusker wisdom back to the far north" as his motivation.

Apart from the obvious impact of wholesale ecosystem disruption if synthetically produced versions of extinct species are introduced into the wild, there are a number of other reasons why de-extinction is a really bad idea. As Professor Paul Erlich from Stanford University argues "it is much more sensible to put all the limited resources for science and conservation into *preventing* extinctions, by tackling the causes of demise: habitat destruction, climate disruption, pollution, overharvesting, and so on. Spending millions of dollars trying to de-extinct a few species will not compensate for the thousands of populations and species that have been lost due to human activities, to say nothing of restoring the natural functions of their former habitats."[5] The ecologist Daniel Simberloff raises another important concern "de-extinction suggests that we can technofix our way out of environmental issues generally, and that's very, very bad."[6]

10. 'Waterproof' nanocoatings

Nanotechnology-based waterproof coatings are taking the internet by storm. Companies such as NeverWet, P2i and UltraEverDry are promising to protect your precious objects, electronics and home surfaces with their nanomaterial products. Albeit for only about a year before they start to break down – especially when exposed to light. These products use a wide range of chemicals, some of which we've sadly encountered before – such as fluorocarbons.

Now, companies are using industrial pulsed-plasma and fluorocarbon polymer coatings, to provide a "'magical' protective liquid repellent nano-coating for smartphones", and other electronic devices. However, perhaps of even more immediate concern to consumers, is *UltraEverDry*.[7] Using a mixture of Bayer proprietary compounds (with names like BAYHYDROL 124) and a mixture of noxious solvents like xylene, *UltraEverDry* is sprayed onto surfaces in two simple stages.

UltraEverDry is ostensibly for industrial use only. The US online shop even lists simple respirators, goggles and gloves for sale – although sadly these were not in stock when we looked. However, this policy isn't enforced and there is lots of evidence of consumer demand and use. On deeper inspection, UltraTech does warn against women using the product, as the chemicals can cause "reproductive toxicity" and are harmful to pregnant women.[8] You've been warned …

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Done deals and revolving doors: the story of GM in Australia

Kath Wilson

Australians are famously early adopters of new technologies. Despite this, most of us are opposed to genetically modified (GM) food crops and are concerned about the multinational industries and lack of regulation surrounding these.[1] Every independent survey[2] of Australians' attitude towards GM shows a majority – including farmers, food manufacturers and major retailers – oppose GM food products.[3]

Yet the story of GM uptake in Australia is one of regulatory failure, industry done-deals, and a revolving-door relationship between industry and government. Multinational GM companies are firmly embedded in a complex of regulators, private and public research institutions, universities, public bodies, science education bodies, public relations companies and industry front groups. In *Edging Towards BioUtopia*, Professor Richard Hindmarsh describes the ways in which this network has created a "social agenda behind the development and regulation of genetic engineering" that "has been constructed or shaped to exclude public knowledge, debate and participation."[4]

Faced with what it regards as a "PR war" against concerned citizens and public health experts,[5] this GM complex has responded with tactics that include: regulatory measures that deny public access to information; systemic exclusion of dissenting scientists from public 'debates'; public 'reviews' into GM whose terms of reference are so narrow as to exclude most arguments against GM products; industry push-polling to focus groups to achieve positive 'results'; appointment of industry proponents on public advisory panels; and the shaming and intimidation of scientists critical of GM products.[6]

From the beginnings of GM regulation in Australia, pro-industry policy was a done deal. Before the Office of the Gene Technology Regulator (OGTR) was established in 2001, Australians' concerns centred largely around the inability to choose GM-free food. Virtually no imported GM foods were labelled as such, and the Howard government dismissed public demands for labelling with the claim that labels and compliance might cost three billion dollars a year.[7] A Department of Finance and Trade report put a more probable case against labelling, saying it might limit "the competitive opportunities of GM food in the marketplace."[8] Put simply, the market wouldn't buy food labelled GM, so it was 'uncompetitive' to give shoppers a choice.

By this time, the seeds of government-industry partnerships were already sown – to the extent that by 2010 Monsanto would own major shareholdings in public-owned agriculture enterprises,[9] on top of its "links to over three quarters of Australia's wheat handling industry through companies like CBH, Cargill and Agrium."[10]

By 1996, Australia's peak science organisation, CSIRO, had developed GM cotton with Monsanto's Bt transgenes, and this had been commercially farmed in New South Wales and Queensland. The only other GM crop grown commercially was the Florigene blue carnation. But this would soon change under the direction of the OGTR's first appointed head, Sue Meek. Meek was not appointed as a public-interest science advocate, but instead for her skills in «commercialisation of biologically-based ventures» and in «promoting the establishment and development of biotechnology-based industry».[11] At the time of her appointment, Meek held a position as Executive Officer of the South Australian Biotechnology Promotion Committee, and she remained a member of AusBiotech, an organisation "dedicated to the development and prosperity of the Australian biotechnology industry." Advising Meek was Michael Leader, who had worked for AgBiotech and CropLife (the peak body of agriculture chemicals industry), and who would go on to advise Monsanto.[12]

The Network of Concerned Farmers (NCF) was among several public interest bodies who called for a parliamentary inquiry into Meek's appointment, arguing that conflicts of interest in the OGTR had meant they "ignore submissions, ignore advisory committees and misrepresent the legislation."

But no inquiry was forthcoming, and in 2002 the OGTR granted the licensing of Roundup-Ready canola. The licences imposed no restrictions or conditions, such as buffer zones, segregation systems or monitoring regimes.[13] Nor did they take into account health, safety or environmental risks. In Senate Estimates, Meek was asked whether the OGTR commissioned any research on the impact on Australian biodiversity of GM crops:

Dr MEEK: *No, we have not.*

Senator CHERRY: *What research have you commissioned on the issue of human health effects of GM crops?*

Dr MEEK: *Directly, we have not commissioned research. Obviously, Food Standards Australia New Zealand does a lot of work in assessing food products.*

Senator CHERRY: *But they have commissioned no research either.*[14]

Indeed, Monsanto, Bayer, Nufarm and other GM enterprises had little to fear from Food Standards Australia and New Zealand (FSANZ), the other principle regulator of GM food products in Australia. FSANZ has approved every GM application to date and relies almost entirely on GM company-provided data for its assessment of safety. It does not require the type of testing that has detected novel protein byproducts and consequent allergic responses to some GM foods, including a CSIRO developed GM pea. Professor Jack Heinemann, geneticist and former US National Institute of Health scientist, raised concerns that FSANZ does not "use the internationally accepted protocol for carrying out a rigorous scientific analysis".[15]

Politicians and media, too, later reflected community concern. An *Age* editorial stated: "To ask Big Agribusiness about GM is a little like consulting Big Tobacco about the risks of smoking."[16] West Australian Premier Alan Carpenter said: "I find it unbelievable and unacceptable that the national food regulator relies principally on the say-so of the GM companies when assessing GM foods as safe to eat."[17]

More recently, the Auditor-General criticised shortfalls in FSANZ's adherence to its own standards, saying "either the information was not provided by the [GM] applicants; or FSANZ had not documented whether the requirements were met."[18]

State government GM bans

Happily for Bayer, Monsanto and Nufarm, these concerns were ignored – and remain so. But the GM companies faced other regulatory hurdles. Responding to public opposition and resistance from key markets including Japan and Europe, Australian state governments adopted GM bans for marketing reasons. These bans were up for review in New South Wales and Victoria in 2008, and in Western Australia in 2010 (Tasmania, the Australian Capital Territory and South Australia currently remain GM-free).

With reviews of the bans looming, the GM industry mobilised. An army of industry lobbyists and industry-funded researchers and agronomists flooded the media advancing the case for GM crops and food, using rhetorics of progress, revolution, competetiveness and inevitability – and of ignorance, fear-mongering and anti-science sentiments on the part of objectors. With strategic precision, the GM sector also organised government and industry-hosted forums in rural locations. These framed public and scientific concerns as anti-progress and hysterical, and the pro-GM line as objective and vital for Australia's economic and environmental prosperity.

Lending credibility to these rhetorics was Australia's peak science body, CSIRO. Under the direction of Australia's Chief Scientist Jim Peacock, who held patent applications on banned GM products,[19] CSIRO fostered strategic partnerships with GM giants including Monsanto and Bayer. By the time the states' GM bans were up for review, CSIRO had developed several GM product patents that depended on bans being lifted for their commercialisation, and the biotech industry sought to "leverage" on CSIRO's public trust to "confront" GM opponents.[20]

CSIRO's aggressive approach to GM promotion included letters to more than 50 high profile chefs who had signed Greenpeace's GM-free Chefs Charter, urging them not to boycott GM food products. Its advocacy was chorused by an echo-chamber of lobbyists who claimed scientific 'consensus'. Among these was the Institute of Public Affairs (IPA), a free-market think-tank that campaigns against citizen-supported NGOs. The IPA is on record as listing Monsanto and tobacco, logging and mining giants as its funders.[21] In addition to a flood of pro-GM publicity, the IPA organised parliamentary forums and industry events with hand-picked scientific panels.

One IPA forum, 'How to beat activists at their own game', toured Australia in April 2005 and was attended by federal, state and local government representatives, as well as Bayer, Graincorp, Nufarm (the Australian licensee of Monsanto's Roundup Ready canola) and the Department of Primary Industries. Drawing on the teachings of RAND, a US military think-tank, the workshops coached participants in tactics to "beat" and "attack" citizens groups, including setting up rival faux citizens' groups, or 'astroturf'.[22]

So it was no surprise that a network of new pro-GM 'citizen' groups emerged, including the Australian Environment Foundation (AEF), a group whose name could be confused with the genuine citizen-supported Australian Conservation Foundation (ACF), but whose registered founders were the IPA's GM campaigners Jennifer Marohasy and Mike Nahan; whose directors include the IPA's Max Rhesse and Climate Skeptic Party president Leon Ashby; whose listed place of business was identical to the IPA address; and whose phone number is identical to that of the Victorian office of the logging industry front group, Timber Communities Australia.

The GM network extended its campaigns throughout rural media and regional speaker forums through the establishment of other organisations. One was the Producers Forum, sponsored by Bayer CropScience and Nufarm.[23] Another was Agrifood Awareness Australia (AFAA), an "industry initiative, established to increase public awareness of, and encourage informed debate and decision-making about gene technology." Also mounting campaigns were Croplife Australia, Ausbiotech, the National Farmers Federation and the Grains Research and Development Corporation (GRDC), which has strategic partnerships with Bayer and Monsanto.

The Age reported that the GRDC, "which imposes a levy of 1 per cent of gross sales on farmers, contributed $100,000 a year to Agrifood Awareness… Agrifood Awareness executive director Paula Fitzgerald said the money was also used for workshops in gene technology run with the CSIRO ..."[24]

In turn, Agrifood Awareness (AFAA) prepared the GM industry's main lobbying document to overturn the bans.

By 2003 GM multinational interests had bankrolled their way into the heart of seemingly democratic bodies like farmers' federations. An *Age* report described a Monsanto and Bayer sponsored Victorian Farmers Federation (VFF) meeting in Mildura, which took votes on lifting the moratorium "after a full morning session addressed by speakers from industry and government supporting the new technology",[25] Speakers at these forums and meetings included farmers on Monsanto's payroll, and VFF heavyweights directed anger and aggression towards farmers supporting the GM bans. [26] The report states that: "Searches of documents from the Australian Securities and Investments Commission indicate that [former VFF head] McGauchie's anger might have had as much to do with agribusiness as it did with agriscience and agripolitics… he shares with other VFF luminaries links to a variety of organisations with financial interests in the introduction of GM crops ..."[27]

University and CSIRO scientists

To further 'leverage' on public trust, biotech marketers enlisted university and CSIRO scientists to sell the GM message. [28] This network projected increasingly inflated figures of improved crop yields and export markets for farmers and investors. By 2008, when the Australian Bureau of Agriculture and Resource Economics (ABARE) claimed that adopting GM crops – including GM wheat and rice – would benefit Australia to the tune of $8.5 billion, the political news site *Crikey.com* was among those who pointed out: "GM wheat and rice aren't even available yet… ABARE admitted that the report was entirely hypothetical. However, that didn't stop Philip Glyde from declaring in a press release that "delaying GM uptake means we are forgoing significant economic benefits for regional Australia." [ABARE] represent, at best, consistently poor research and modelling. But they are not without real world consequences, because they form the basis of long-term government policy."[29]

Government modelling also relied on GM company profit (and crop yield) projections that were equally overblown. For its "wholly misleading representations about its profit capacity", Nufarm (the sole Australian distributor of Monsanto's Roundup Ready canola) was sued by class action for allegedly misleading the market.[30]

Improved profits weren't the only inflated claims. Despite the expenditure of billions of dollars of public and private money over the past 30 years, the promises of commercial GM crop varieties with increased yield, drought-tolerance, salt tolerance, enhanced nutrition, a nitrogen-fixing grain, longer shelf life or other traits had not eventuated.[31]

In a bold public relations manoeuvre, this was spun by proponents as the very reason to revoke the bans. That potential GM traits took decades to develop, costing hundreds of millions of dollars with untold risks, meant that Australia should end the bans to encourage investors "with deep pockets and brave hearts" into agbiotech, argued proponents such as Glenn Tong. Tong who is chief executive of the Molecular Plant Breeding Co-operative Research Centre and has many GM company interests[32] wrote in *The Age* that "Ignoring GM technologies would sentence wheat farmers to at least another 40 years of frost risk… it is in our best interest to minimise unnecessary barriers to investment such as state-based moratoriums against GM crops."[33]

Although this network and its rhetorics failed to sway public opinion, it was apparent that lifting the bans were *fait accompli* in Victoria and New South Wales (and later, Western Australia). *The Age* reported: "[Victorian] Treasurer John Brumby and Premier Steve Bracks… regard the ban as running counter to the aim of making Victoria

an international hub for biotechnology. "They wouldn't be in Boston (for Bio 2007) saying, 'We're going to extend the moratorium', would they?" asks one Labor MP."[34]

Indeed, while the public was assured of community consultation and a 'review', Bracks continued opening new multimillion dollar agbiotech complexes geared towards commercialisation,[35] and it was an open secret among industry insiders that the Victorian ban would be lifted.[36] *Australian LifeScientist* assured its readers in 2003 that "the Bracks government has quietly let it be known that it opted for the temporary pause to give the biotech industry 12 months to "make a noise".[37]

In May 2007 the Victorian government announced that an 'independent' panel would 'review' the bans. But the panel members' pro-GM stances were already on public record. The terms of state reviews were economic, and farmers and other public had no avenue to submit legal, political, scientific, ethical, health or environmental cases against the lifting of the bans.

Markets withdrawing from GM

Even so, many people and organisations made submissions, and much evidence suggested there was market demand to stay GM-free. Worldwide, many markets were withdrawing from GM. The European Union was discussing the official withdrawal by the biotech industry of five GM foods and crops.[38] A report by DFAT warned that the economic impact of segregation could "have the effect of discouraging traders and processors from trading or using GM foods."[39]

But in 2007 it was announced that the Victorian GM canola ban would be lifted. New South Wales followed in 2008, and Western Australia in 2010. With the bans overturned, a resistant public had yet to be placated. A powerful behind-the-scenes GM proponent was (and remains) the Australian Science Media Centre (AusSMC), a public relations body that generates and gatekeeps many news stories. AusSMC was initiated in 2005 in Adelaide by Baroness Susan Greenfield,[40] also patron of the British Science Media Centre, an organisation accused by *The Guardian* of being set up "to promote the views of industry and to launch fierce attacks against those who question them."[41] However, criticism of AusSMC is problematic, as it is funded not only by corporate giants but also by most of the major media outlets to which it generates stories (including the ABC and commercial stations, Fairfax and News Limited) – as well as state governments and universities, making it ostensibly public-interest based and "free of bias" (as it claims to be).[42]

However, many who serve or have served on the AusSMC advisory board are committed biotech industry proponents with industry links.[43] For example Professor Adrienne Clarke was employed as Victoria's "biotechnology ambassador"; Professor Peter Doherty was patron of BioMelbourne, a body established to "promote the specific interests of the Victorian biotechnology sector", whose role is "progressing [sic] bio-business", "connecting biotechnology, business and government" and playing "a specific role . . . as influencer [to ensure] influential input into the industry's direction and development". Professor Doherty regards those in support of banning GM crops as "a religious movement" nursed by the "chattering classes". Sir Gus Nossal, who recommended the overturning of the Victorian GM ban, also sits on the advisory board.

When asked by *Crikey* why it only enlists pro-GM scientists in its media panels, AusSMC's CEO Susannah Eliot replied: "The issue is so polarised it gets tricky to select a panel. Many scientists are happy to discuss the issues privately but aren't willing to speak publicly because they don't want to be labelled as pro- or anti-GM."

Australian scientists are discouraged from airing their concerns about GM in many ways. The most urgent obstacle is a refusal by GM companies to allow analysis of patented products. As nutritionist and biochemist Dr Rosemary Stanton OAM explains: "Independent researchers have found it almost impossible to get GM seed to carry out safety checks and any farmer who buys seed is forbidden to allow it to be used for research purposes. Scientists who question the technology are marginalised."[44]

The issue has become so divisive scientists are intimidated. Those who question or criticise the claims made for GM technologies, or who urge a precautionary approach to GM products, can suffer huge personal consequences. An example of this was the sacking of Dr Maarten Stapper, a principal research scientist at CSIRO. Dr Stapper was reportedly "sceptical about claims that GM plants improved crop yields and called for more studies on the safety of GM stockfeeds". He was subsequently sacked in 2007 after 23 years of service.[45] Dr Stapper said his sacking was because of his criticism of genetically modified crops. CSIRO reportedly "tried to gag" his criticisms and "bullied and harassed" Dr Stapper to "give up all my beliefs about good agriculture and keep my mouth shut about GM." He is reported as saying: "I didn't want that because I have a connection with the farming community and they trust me."[46] Other scientists, including Patrick Fels and Dr Judy Carman, have suffered similar attacks.[47]

This year, hundreds of senior scientists worldwide signed a petition stating that "The claimed consensus on GM organism safety does not exist".[48] Despite this, untold billions have been spent worldwide in an attempt to support the GM multinationals, discredit opposing science and stonewall public concerns. GM products continue to be spruiked as "addressing global food security issues" – despite these claims being debunked by international development bodies. These bodies have long argued that development of GM food is motivated by the corporate control of farming, not by public interest.[49]

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'Partner or Perish'? The convergence of public and private interests pose new questions for controversial university research

Kristen Lyons

There is a part of the University of Queensland's (UQ) history that is the stuff of a thriller novel. It is well known the Mayne family bequeathed land where the UQ St Lucia campus now sits,[1] and that the family continues to regularly donate to the University, with the family trust providing $20 million alone to the University between 2000 and 2010.[2]

While the Mayne family was one of the richest families in Brisbane's early settlement period, a shadow is cast over the source of their wealth. On his deathbed, the successful businessman Patrick Mayne confessed to the robbery and murder of Robert Cox, a crime for which an innocent man was charged and hanged. As a way of making good for this tragic injustice, and Patrick's guilt, his children went on to establish generous philanthropic endeavours, from which UQ has significantly benefitted.

While this tale is a unique part of UQ's history, what is commonly shared with other Australian universities is the extent to which private donations, alongside corporate and industry investment, make a significant contribution to infrastructure, research and development budgets.

But what does this nexus of public and private interests mean for the independence and integrity of research and teaching at Australian universities, especially in instances where collaborations are with controversial industries and sectors such as mining, biotechnology and nanotechnology? And what might it mean at a 'Group of Eight' university like UQ, where industry investment is especially pronounced? For example, in 2011, UQ generated an annual research income from industry of $87 million,[3] second only to the University of Sydney.

Government steps out

This trend towards private investment in universities is backed by the Government's endorsement of public/private collaborations. In the 2009 Powering Ideas report the then Department of Innovation, Industry, Science and Research committed to doubling the level of collaboration between Australian universities and businesses over the next decade. UQ's Vice Chancellor Professor Peter Hoj has also declared the success of academic institutions in the 21st century will rely on the old adage "'publish or perish' (being) replaced by 'partner or perish'".[4] Hoj appears to be suggesting "success" will be measured by an institution's ability to build strategic alliances with private investors. If this is the new measure of success, then UQ, like many other Universities, is flourishing!

Australian universities have experienced a downturn in public funding since at least the 1980s as part of neoliberal reforms that have driven privatisation across many sectors. Continuing during the Howard era, government funding for the tertiary sector was further whittled away, a path that is set to continue under the Abbott Government. Since late 2013 when Abbott took office, we have seen the withdrawal of government funding for research generally, including cuts to the Commonwealth Scientific and Industrial Research Organisation (CSIRO), as well as the decline in climate change and other research that might be seen as out of step with the current government's mandate. The recently announced 2014 budget specifically targeted the Australian Research Council – a vital funding pool for academic researchers – cutting $74.9 million over the next three years.

While the Abbott Government describes its education budget as delivering institutional freedom, creating the conditions for education 'diversity and innovation,' as well as better equipping universities to flexibly respond to student needs, the reality is that the culture of public austerity extends and invites opportunities for private sector participation in universities.

The private sector steps in

As the value of private sector university investment expands, and private investors move from the status of 'donors' to 'research partners and/or collaborators', how can we ensure universities maintain independence and integrity as 'public good', rather than 'vested interest' or 'highest bidder' research and teaching institutions? In seeking to manage such issues, UQ has recently revised its Code of Conduct and Conflict of Interest Policy. But questions remain about how effective such codes and policies are.

Australian universities have experienced a downturn in public funding since at least the 1980s as part of neoliberal reforms that have driven privatisation across many sectors

While there are undoubtedly examples of private investments into both physical and social sciences research that have delivered public good outcomes, a number also raise serious questions regarding independence, integrity and ethics. Some notable examples include the University's Sustainable Mineral Institute (SMI). This received around $27.5 million (58% of its total budget) from industry funds in 2011 alone – including mining giants Rio Tinto, Xstrata and Anglo American.[5] In 2012, the SMI established the Centre for Coal Seam Gas, with funding in the order of $3 million, for five years, from three of the largest CSG companies operating in Australia – the Queensland Gas Company, Arrow Energy and Santos.[6]

At a 'public event' organised by the Centre, and intended to seek UQ community feedback and input on its research activities, the Centre Director explained that rather than shying away from the CSG industry by sitting as an "observer", UQ's Centre for Coal Seam Gas was "taking a position", by engaging in research collaborations with large industry stakeholders. But just what position is the Centre taking? And to what extent might funding impact upon Centre researchers' autonomy in research design and communication of findings that may be negative for the commercial interests of the industry? For example, are researchers able to ask the difficult and critical questions in the public interest about the health and environmental impacts of coal seam gas, as well as the full lifecycle impacts associated with the CSG industry?

In recent years, UQ also initiated a collaborative venture worth $10 million with Dow Chemical to establish the Dow Centre for Sustainable Engineering Innovation. While the Centre has a stated aim to "pursue an imaginative program of research and collaboration aimed at harnessing solutions designed to confront the big sustainability challenges of the 21st Century",[7] the company's history in chemical manufacturing – including for use in agriculture and war – has left an environmental and public health legacy that raises questions about Dow's commitment to sustainability. It also bears considering what UQ's association with Dow might mean for the University's reputation..

Bioengineering and Nanotechnology

UQ's Australian Institute for Bioengineering and Nanotechnology (AIBN) appears a consummate example of the "partner or perish" model for research that is being framed as the future for the University. Its website and annual reports articulate a clear and resounding commitment to research excellence that is industry focused, and to the generation of research outcomes that can translate into commercial products that support industry expansion.[8] To date they have been highly successful in the pursuit of these goals, with four start-up companies directly building on research outcomes from the Institute.

The AIBN is engaged in work across four areas: health, energy, manufacturing and sustainability. The scale and scope of its research projects are impressive, with 45 projects listed across these four areas. The majority of these projects appear to focus on nanomaterials (they list 27 projects) and nanobiotechnology (22 listed projects).[9]

There are a number of aspects related to the organisation and management of the AIBN that demonstrate its strategic commitment to commercialisation and industry engagement. The Institute has established direct and formal links with many industry collaborators. To do this, the AIBN seeks private funding via its 'Industrial Affiliates Program' – with a three-tiered members scheme that ranges in annual fees from $1,500 to its 'premier' membership priced at $30,000 per annum. Members include Dow, PharmaSynth and Unilever.

With so-called 'customised access packages', industry partners are offered special access to academic staff, and are able to nominate qualified people to join as official Affiliates of the University. In this partnering up, not only do public/private collaborations form, but there is also a blurring of boundaries between each of these interests, as 'premier' members establish official links with the University.

What does this consolidation mean, exactly? For example, what rights and privileges does access afford industry Affiliates, including their influence in shaping the kinds of research scholars do, and the communication (or withholding) of research outcomes? Given the

highly controversial nature of some biotechnology and nanotechnology research – raising as it can profound social, environmental, ethical and economic questions – transparency and openness about the form and impacts of these partnerships is important.

Industry interests are also present on the Board of the AIBN. For example, members of the seven person board have held positions with Herron Pharmaceuticals, Johnson and Johnson, Eli Lily, BP and the Australian Food and Grocery Council. The board also includes the founder of the Australian Biotechnology Association and has a broad ambit. This includes providing direction on Institute governance, assessing future funding opportunities and research commercialisation pathways, as well as growth strategies for the Institute. To what extent do board members' ties with industry and sectoral interests inform these responsibilities, and do these ties present a potential conflict of interest, and if so how are these managed?

Given this strong commitment to commercialisation and industry engagement, what scope is there for researchers at the AIBN to engage in research oriented towards health, environmental and social issues related to biotechnology and nanotechnology that may not be immediately commercially attractive? And is there room – and financial support – for social and ethical research that might increase our understandings of the impacts of these new technologies?

Four start-up companies have directly emerged from the activities of the Institute; Vaxxas, TenasiTech, Pepfactants and ACYTE Biotech. ACYTE is engaged in the development and commercialisation of cell cultures from Chinese hamster ovary cells for use in drug development studies and the generation of cell lines for therapeutic uses. It was started by the AIBN Director, Professor Peter Gray, and is run by a board of directors representing shareholders; including UQ, and founders and inventors of the technology held by the company.[10] Let's make sure we've all got that. The founding director of this company also directs the AIBN. This arrangement represents a convergence of public and private sector interests, raising questions about the types of research to which scholars might be driven to engage. For example, would this now or into the future, drive academics to engage in research and development in fields oriented towards the production of knowledge that is commercially viable? What might be some of the broad and long term impacts of this trend?

Independence and integrity must be central to controversial scientific research

Ensuring scholarly and institutional independence and integrity must be central to research and development, especially in controversial fields such as mining, biotechnology and nanotechnology. Such principles will be vital to ensure new knowledge generation can assist in planning for a sustainable future, including managing the risks associated with new technologies, alongside broader community hopes and aspirations related to science and technological innovation.

While 'partner or perish' might be the mantra for universities of the 21st century, more critical discussion – both within and beyond universities – is required, about what these alliances might mean for the types of research they drive, and how we can ensure there remains a strong place for 'public good' research and development, regardless of how it is funded. There is an urgent need to shine a light into the dark corners of private/public funding arrangements and their impacts on university research. Open and transparent governance of research centres and institutions, as well as ensuring independent impact assessment and broad public debates, will all be required to ensure the private research funding model is able to support 'public good' research.

Like the Mayne family, all universities, including the University of Queensland, need to come to terms with the sources of their wealth, and the implications that come with that.

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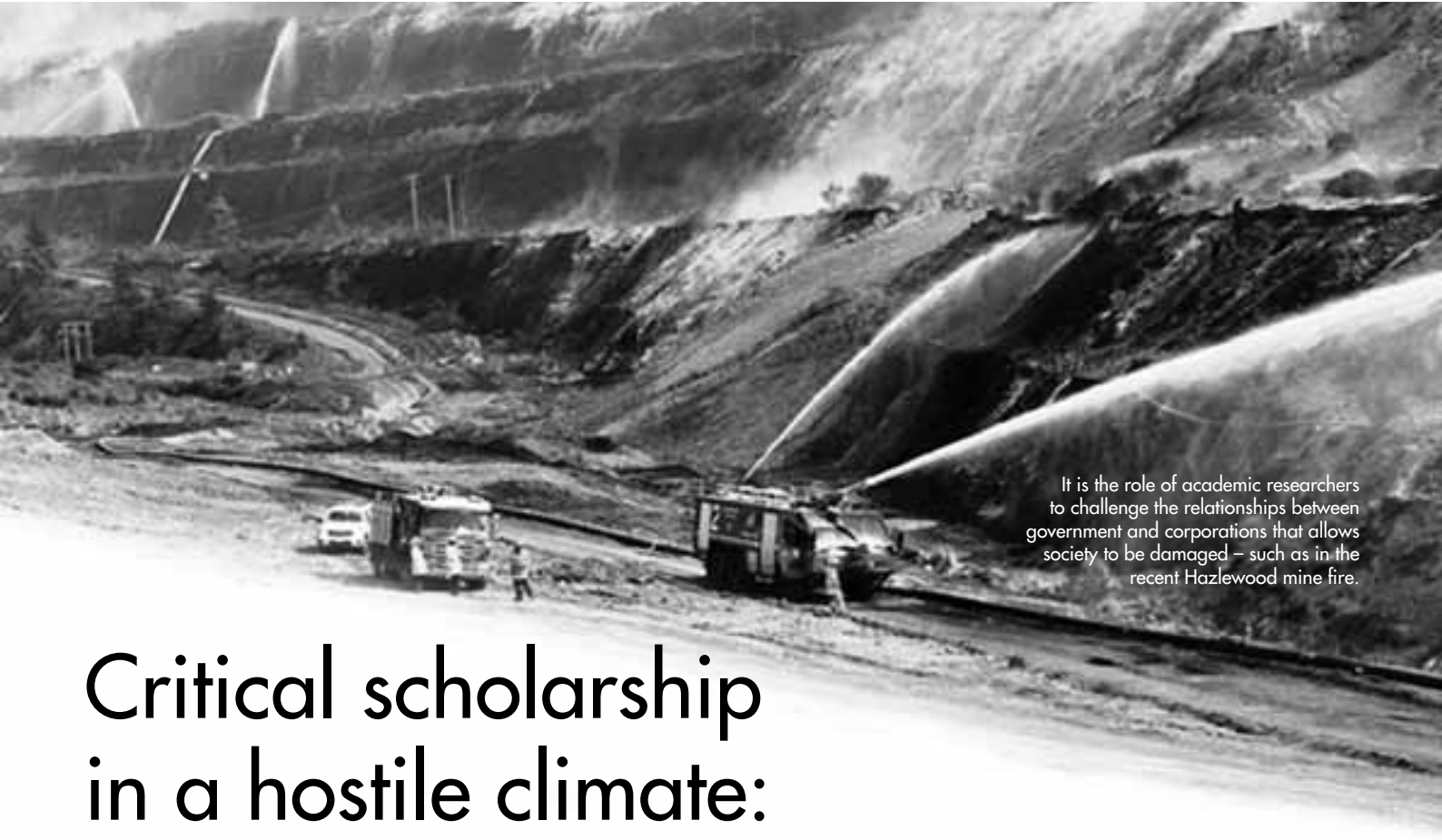

It is the role of academic researchers to challenge the relationships between government and corporations that allows society to be damaged – such as in the recent Hazlewood mine fire.

Critical scholarship in a hostile climate: academics and the public

Steve Tombs and David Whyte

Corporations are involved in every area of our lives. In our education, health, welfare and criminal justice systems, they are ever-present.

So obvious is this 'fact' of life that it is often only in moments of crisis – such as the recent Hazelwood coal mine fire for the residents of Morwell – that we bother to question the consequences of corporate activity.

That said, and with no hint of irony, in the same week that the fire at Hazelwood was extinguished, the Abbott government announced its "red tape bonfire": 12 deregulation bills, to be rolled out through the autumn, all of which will further free business from its burdens of regulation.

Whose 'burden' is it?

The idea that regulation is a burden to be lessened is a mantra for politicians and a growing number of academics. But this ignores the weight of evidence that the significant burden of corporate activity is shouldered by the most vulnerable.

Combined World Health Organisation and International Labour Organisation data shows that more than one in eight deaths across the globe are the result of air pollution or working. Our research has shown that most deaths caused by working and air pollution are caused by corporate activity. This is a basic but very clear indicator of how profit is privatised and how the 'burden' of risk is really distributed.

This should be the starting point for thinking about we regulate corporations, particularly in the wake of the Hazelwood fire. Carcinogenic air pollutants in Morwell have been estimated at 20 times the average level.

However, such facts are barely acknowledged by academics when they analyse and develop strategies of corporate regulation. We used to take it for granted that university researchers would be able to ask the most difficult, challenging and important questions. At the very least, they would expose political rhetoric when it is palpably nonsense.

There is a very large body of academic researchers – with the most influential based in Australia – who study corporate regulation. Their work tends to end up in obscure journals; much of it is funded by governments and corporations themselves; and it is used by policymakers to legitimise deregulation.

These researchers rarely stand alongside social movements that seek to challenge the dominant political agenda, which sees public protection as a "burden".

The entrepreneurial university

The freedom to ask awkward questions about corporate – and, relatedly, state – power is increasingly subjected to a range of subtle and not-so-subtle controls.

Reliance on, or craving for, business and state funding for research makes it less rather than more likely that academics will ask why governments have failed to protect us from corporations. Academics are not just pushed to seek such funding: they are increasingly performance-measured by the extent to which they secure it.

Those pressures are driven by university managers obsessed with rankings tables, generating pressure to publish academic papers in a narrow band of 'prestigious' journals at the expense of publishing for wider, non-academic audiences.

Meanwhile, 40-60% of all Australian university academics are on fixed-term, often short, contracts. The casualisation of employment within contemporary universities weakens the ability of academics to resist the entrepreneurial demands of management.

The net effect of these changes is that university researchers – nudged and cajoled into courting business – are less likely to open up the skills and resources of the university to those relatively powerless, vulnerable, disadvantaged groups in our societies.

They are also less likely to frame their research questions in line with the concerns and needs of these groups, and are less likely to make the fruits of their research freely available to groups outside the university.

Holding power to account

These observations raise certain key questions. Where might non-official knowledge that challenges our assumptions about corporate activities and who really shoulders the 'burden' of these be generated?

How might this knowledge contribute to a debate about the more effective regulation of corporate activity and about greater state accountability for its collusion in the production of corporate harm?

And finally, how can academic work support those engaged in struggles for justice – such as the residents of Morwell, consistently reassured by government and corporation that they are in no danger from the airborne pollution caused by the fire?

However hostile the climate of the entrepreneurial university, those of us who work in academia enjoy relative privilege – some much more than others. We have access to resources which most other workers simply do not enjoy. This entails a responsibility to put those resources to work in a genuinely critical way which aspires to further social justice.

As the fallout from Hazelwood unfolds, whatever the inquiry uncovers, we can be certain of one thing. A critical scrutiny of the history of the mine, its privatisation, the licensing and regulation regime, and the nature of the response to the fire would all shed some light on the murky world of state-corporate relationships, where power and profit collide and collude.

We can also be sure that both the government and the owners, GDF Suez, will do all they can to ensure that business-as-usual proceeds, protected by the state, even as it claims legitimacy in the name of protecting workers and the public.

It is the role of academic researchers to challenge the political rhetoric and the collusive relationships between government and corporations that allow workers, communities and the environment to be endangered. We can only do this by aligning ourselves more closely with the social movements and campaigns fighting for social justice, rather than with governments, politicians and corporations.

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Corporate influence over nanotechnology regulation

Louise Sales

I recently attended an Organisation for Economic Co-operation and Development (OECD) seminar on the risk assessment and risk management of nanomaterials. This was an eye-opening experience that graphically illustrated the extent of corporate influence over nanotechnology regulation globally. Representatives of the chemical companies DuPont and Evonik; the Nanotechnology Industries Association; and the Business and Industry Advisory Committee to the OECD (BIAC) sat alongside representatives of countries such as Australia, the US and Canada and were given equal speaking time.

BIAC gave a presentation on their work with the Canadian and United States Governments to harmonise nanotechnology regulation between the two countries. Repeated reference to the involvement of 'stakeholders' prompted me to ask if any NGOs were involved in the process. Only in the earlier stages apparently – 'stakeholders' basically meant industry.

A representative of the Nanotechnology Industries Association told us about the European NANoREG project they are leading in collaboration with regulators, industry and scientists. This is intended to 'develop ... new testing strategies adapted to innovation requirements' and to 'establish a close collaboration among authorities, industry and science leading to efficient and practically applicable risk management approaches'. In other words industry will be helping write the rules.

Interestingly, when I raised concerns about this profound intertwining of government and industry with one of the other NGO representatives they seemed almost dismissive of my concerns. I got the impression that most of the parties concerned thought that this was just the 'way things were'. As under-resourced regulators struggle with the regulatory challenges posed by nanotechnology – the offer of industry assistance is probably very appealing. And from the rhetoric at the meeting one could be forgiven for thinking that their objectives are very similar – to ensure that their products are safe. Right? Wrong.

Ultimately corporations have one primary driver and that's increasing their bottom line. This means externalising the environmental and human health costs associated with their products in any way possible, minimising regulation and fighting to keep products on the market, even when it's revealed that they are unsafe. So no – their objectives shouldn't be the same as regulators – that's if regulators are doing their jobs properly.

Unfortunately the impact that this level of entanglement between industry and government has had is evident in nanotechnology regulation (or lack of it) the world over.

In 2010, the European Commission's Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) recommended that substances be categorised as nanomaterials if more than 0.15% of the particles were less than 100 nanometers in diameter. One year later, following industry consultation, the European Commission produced a revised definition requiring at least 50% of the number of particles to be between 1–100nm before the substance was categorised as a nanomaterial – over 300 times what SCENIHR recommended. Under this definition substances can contain 49.9% nanoparticles and companies can still claim their product to be non-nano!

In March this year, industry's invisible hand became visible once again when the European Commission proposed that Parliament grant a blanket exemption from food-labelling requirements for nano-additives already on the market. Fortunately, the European Parliament rejected the proposal.

Regrettably, this kind of industry influence is not confined to Europe. In Australia, an independent, government commissioned review of food labelling laws in 2012 recommended that food products containing materials from new technologies, such as nanotechnology, be labelled for at least 30 years as an act of precaution. The proposal was rejected by the state and federal governments without comment.

So why does this happen? Some of the measures are well known, such as campaign financing and intense and frequent lobbying pressure. However, there are much deeper systemic problems that influence the way governments regulate new technologies. These include the institutionalised belief that social progress is the same thing as continuous technological advancement and that technology will somehow make it possible to achieve limitless growth. These deeply held beliefs have led to government viewing critical regulation to protect human health and the environment as 'red tape' and 'barriers to innovation'.

Although banning corporate political donations would be a step in the right direction, unfortunately it would do little to affect the enormous influence industry wields over government. In order to resist dangerous, unsustainable and unjust technologies and ensure that useful technologies are used equitably we need to challenge both assumptions about growth, technology and progress and the more overt mechanisms of corporate influence. We need to expose the extent to which technological innovation is driven by commercial and military interests and the role of government in furthering these interests through the funding and promotion of certain technologies.

There are no easy solutions but it is vitally important for the future of the planet that we begin to grapple with these issues.

Corporate efforts to impede renewable energy

Mark Diesendorf

On 6 May 2004 the then prime minister of Australia, John Howard, and the then industry minister, Ian Macfarlane, were participating in a meeting of the Lower Emissions Technology Advisory Group, which comprised CEOs of the major fossil fuel producing and consuming corporations. The CEOs expressed concern about the rapid growth of the renewable energy industry, especially wind power. Notes from the meeting, leaked to the ABC and reported on national radio's *PM* program of 7 September 2004, revealed that the politicians discussed ways and means of limiting the growth of the renewable energy industry and thus protecting the fossil-fuel based industries. Subsequently, at least five ministers, including the prime minister, made verbal attacks on wind power within a period of a year.

This apparent collusion between the Howard Government and the big greenhouse gas polluters was confirmed in 2007 by Guy Pearse. As a member of the Liberal Party and a former ministerial adviser in the Howard Coalition Government, Pearse was able to obtain frank interviews with the captains of these polluting industries for his PhD thesis. They boasted to him that they, the self-styled 'Greenhouse Mafia', were responsible for writing government policy on greenhouse response. Disillusioned, Pearse became a whistleblower, exposing these corporate influences in his book, *High and Dry*. The Rudd Labor Government won office in November 2007 with a promise to expand renewable energy in Australia as one of its policies. However, the new government's failure to implement its promise – by not making the necessary financial allocations to renewable energy in the May 2008 budget and its failure to set up the appropriate institutions – demonstrated that the change of government did not bring a significant change of policy implementation. Apart from the symbolic gesture of ratifying the Kyoto Protocol, the new government delayed action on its principal election promises to support renewable energy. In particular, it took three years to implement the promised expansion and time extension of the Renewable Energy Target in a moderately effective form, although only small modifications to the existing legislation were actually required.

Nevertheless the alliance with the Greens that kept the re-elected Rudd-Gillard Labor government in power from 2010 to 2013, led to some modest federal government policies for climate action in general - and renewable energy in particular. A carbon price was implemented; various existing research, development and demonstration programs were combined under the new Australian Renewable Energy Agency (ARENA); and the 'Valley of Death' between demonstration and early commercialisation of renewable energy technologies was addressed by the creation of the Clean Energy Finance Corporation (CEFC). However, Labor's energy minister, Martin Ferguson, was strongly committed to the fossil fuel industries and the government was clearly reluctant to promote and defend climate action and renewable energy.

Responding to public pressure, the states implemented feed-in tariffs, initially over-generous, for residential renewable energy systems. The subsequent rapid growth of solar photovoltaic (PV) electricity, the corresponding rapid reduction in its price and the decline in electricity demand – which has occurred every year since 2010 – galvanised the fossil fuel and electricity generation industries into an intense lobbying and media campaign. There are several causes of this decline. Retail electricity prices have escalated, resulting primarily from the tens of billions of dollars being spent on upgrading poles and wires. Higher retail electricity prices encourage energy efficiency and solar PV, both of which are now low-cost.

In South Australia, which generates 27 per cent of its grid electricity from wind, one of its two coal-fired power stations has been shut down, apparently permanently, while the other has been restricted to operation for half the year. The writing is on the wall for coal power. The large contribution from wind has reduced the wholesale price of electricity and cut the revenue for coal power. Incidentally, the reduced wholesale price has not been passed on to retail customers.

Election of a federal Coalition government in 2013 and state Coalition governments around this time gave the fossil fuel industries and electricity utilities a power structure

that is even more receptive than Labor to lobbying by vested interests to put the brakes on climate action and renewable energy. As a result, ARENA's funding has been cut by $800 million and the Climate Commission (which advises the public) has been closed, although the crowd-funded Climate Council has arisen from its ashes. If the government gains the numbers when the new Senate takes office in July 2014, it will terminate the carbon price, close the CEFC (which has been very successful and profitable in levering private investment in renewable energy) after only one year of operation, and close the Climate Change Authority (which advises government).

The federal government's announcement of another review of the Renewable Energy Target by a committee of supporters of fossil fuels and nuclear energy has stopped the development of new wind farms.

Meanwhile, vested interests and their supporters are spreading numerous myths hostile to renewable energy, all of which are either completely false or grossly exaggerated. Table 1 summarises their refutations, discussed in more detail in my book *Sustainable Energy Solutions for Climate Change*.

Despite the myths, which are repeated endlessly by the Murdoch Press and politicians, there is still strong public support for renewable energy. Environmental NGOs, sustainable energy businesses, the Australian Solar Council and Solar Citizens, a lobby group of owners of solar energy systems, are offering growing resistance to the vested interests.

Economics gives further support. For most households and businesses that use significant amounts of electricity during daytime, obtaining that electricity from rooftop solar PV is now cheaper than buying it from the grid. Although wind farms cannot yet compete with dirty coal power in the absence of a medium-level carbon price, wind energy is already much cheaper than nuclear energy and is also competitive with the estimated costs of coal power with carbon capture and storage in most locations. Corporate interests can slow the growth of renewable energy, but cannot stop it.

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Table 1: Renewable Energy Myths circulated by Corporate Interests

MYTH: Renewable energy is too variable or 'intermittent' to reliably make the major contribution to electricity supply	Hourly computer simulations, spanning up to a decade of real data on electricity supply and demand, show that 80–100% renewable energy can supply electricity just as reliably as conventional power stations. Reliability is achieved by having a mix of variable renewables (e.g., wind and solar photovoltaics (PV)) and flexible, dispatchable renewables (e.g., hydro with large dams, gas turbines burning renewable gases and liquids, and concentrated solar thermal power with thermal storage). Geographic dispersion of renewable energy generators and reductions in demand peaks in 'smart' grids further increase reliability.
MYTH: Base-load power stations are necessary and renewable energy cannot provide them	Base-load power stations, such as coal or nuclear, are unnecessary for supplying base-load demand reliably. This is shown by both hourly computer simulations of electricity supply from 100% renewable energy and practical experience with high penetrations of wind power into electricity grids.
MYTH: Coal-fired power stations must be operated continuously as back-up for variable renewable energy systems	Again, both practical experience and computer simulations bust this myth. In South Australia, where 27% of annual electricity is generated from wind, one of the two coal-fired power stations has been shut down and the other is now only operated for half the year. No additional gas-fired power stations have been installed. Computer simulations confirm that base-load power stations, such as coal and nuclear, are too inflexible to be partners with large amounts of variable renewable energy. The necessary partners are flexible power stations, which can be entirely renewable.
MYTH: Renewable energy is too expensive	Once true, but now no longer. In many countries solar PV has become economically competitive with retail electricity prices and in a few locations it is also becoming competitive in the wholesale market. On-shore wind is competing with conventional power stations in the wholesale market in several countries. Both solar PV and wind are continuing to become cheaper, while coal and nuclear power stations are becoming more expensive.
MYTH: Renewable energy receives huge subsidies	Subsidies to renewable energy have been decreased to the point where they are generally much smaller than the direct economic subsidies to fossil fuel based and nuclear energy. In addition, fossil fuel and nuclear energies receive huge indirect subsidies resulting from the failure to include in their prices their huge environmental and human health costs.
MYTH: Renewable energy is not ready to replace fossil fuels	A sufficient variety of commercially available renewable energy technologies are ready to replace fossil-fuelled electricity. Of course renewable energy has to be scaled up, however this can be done much more quickly than for fossil and nuclear power stations, because wind and solar technologies are mass-produced in factories and the installation is very rapid. For urban transport, cycling, walking, improved mass transit and vehicles fuelled by renewable electricity can replace most fossil-fuelled vehicles. For rural road and air transport, renewable energy still needs further development.
MYTH: Renewable energy is too diffuse to run an industrial society	There is ample marginal land on the planet to provide all the solar energy required, while wind farms are compatible with almost all forms of agriculture and occupy only 1–3% of the land they span. While not all countries are equally blessed with renewable energy resources, trade in renewable energy by transmission lines and by transporting renewable hydrogen in LNG tankers could supply disadvantaged regions.
MYTH: Energy payback periods (in energy units, not money) for renewable energy systems are comparable with their lifetimes	This was once true in the early uses of solar PV in satellites. Nowadays energy paybacks for solar PV modules are typically 0.5–1.8 years and for wind turbines 0.25–0.75 years, depending on location and technology type. The lifetimes of these technologies are about 25 years each. For comparison, energy payback periods for nuclear energy are 6.5–14 years, depending on whether high- or low-grade uranium ore is mined and milled.
MYTH: Danish electricity prices are among the highest in Europe, because of the high use of renewable energy in Denmark	Danish electricity prices are among the highest in Europe, because the tax on electricity is very high in Denmark. This tax goes into consolidated revenue; it does not specifically subsidise renewable energy. When European electricity prices without taxes are compared, Denmark's is in the lowest quartile.
MYTH: The doubling of retail electricity prices in Australia in recent years is primarily the result of the carbon price and the Renewable Energy Target	By far the biggest contribution to the increase in electricity prices in Australian states comes from the costs of upgrading the distribution system (poles and wires). In 2013–14 the distribution network was responsible for about two-thirds of average retail electricity price, the carbon price 9% and the Renewable Energy Target about 2%. However, the latter would be offset by the reduction in wholesale electricity price from wind farms, if it were passed on to retail customers.
MYTH: Infrasound (sound that is too low in frequency to be heard by the human ear) from wind turbines causes a wide range of ill health symptoms	As confirmed by 19 studies, there is not a shred of scientific evidence to support this claim. A randomised, controlled, double-blind trial shows that people cannot distinguish between infrasound and sham infrasound (silence) and that illnesses attributed wrongly to infrasound can be psychologically induced by anti-wind propaganda.

Geopiracy: Patent law, climate change, and geoengineering

Matthew Rimmer

Patent law is a regime of intellectual property, which provides exclusive rights regarding scientific inventions, which are novel, inventive, and useful. There has been much debate over the limits of patentable subject matter relating to emerging technologies. The Supreme Court of the US has sought to rein in the expansive interpretation of patentability by lower courts in a series of cases dealing with medical information (*Prometheus*), finance (*Bilski*), and gene patents (*Myriad*). This has led to a reinvigoration of the debate over the boundaries of patentable subject matter. There has been controversy about the rise in patenting of geoengineering – particularly by firms such as Intellectual Ventures.

Intellectual Ventures is a private company founded by Nathan Myhrvold and Edward Jung of Microsoft, and later joined by Peter Detkin of Intel and Gregory Gorder of Perkins Coie. The company's motto is 'inventors have the power to change the world'. In 2009, Intellectual Ventures explained its interest in the field of geoengineering.[1]

The company sought to normalise the technology. Intellectual Ventures stressed that geoengineering should be considered as a form of large-scale engineering: "Geoengineering" describes how the earth's systems can be influenced by engineering solutions. There are many historic examples of how humans have used technology to change geological systems. From using fire to drive game to building irrigation for agriculture, seeding clouds during droughts, reversing the Chicago River to building the Hoover dam, the term can encompass all sorts of ideas. Today, options discussed often include large-scale engineering of the environment in order to combat or counteract the adverse effects of human-induced changes in the atmosphere and climate."

Intellectual Ventures has made significant investments in geoengineering patents. The company is coy about whether it plans to profit from these patents. Intellectual Ventures observes: 'Intellectual Ventures invents new technology as its main business, but we do not expect or intend that our climate technology inventions will make money.' Intellectual Ventures maintains that its program is a humanitarian one.

However, the company has its detractors. In 2011, *This American Life*[2] noted that Intellectual Ventures had been subjected to fierce criticism: "There's an influential blog in Silicon Valley called TechDirt that regularly refers to Intellectual Ventures as a patent troll. Another blog, IP Watchdog, called Intellectual Ventures "patent troll public enemy #1." And the Wall Street Journal's law blog had an article about Intellectual Ventures titled "Innovative Invention Company Or Giant Patent Troll?"

The radio show contended that Intellectual Ventures used a corporate web of companies, and a hoard of patents, to pressure companies to either submit to patent licence fees or litigation.

For his part, Nathan Myhrvold denied the accusation: 'Well, that's a term that has been used by people to mean someone they don't like, who has patents. I think you would find almost anyone who stands up for their patent rights has been called a patent troll.' Intellectual Ventures argues that it provides a licensing system to enable access to key inventions.

Nonetheless, there has been empirical evidence – particularly from Professor Colleen Chien – that strategic litigation by patent assertion entities is a widespread problem, particularly in the US. In 2013, President Barack Obama and the White House announced the introduction of a package of reforms to address the issue of 'patent trolls'.[3] The Obama administration promised to take executive and legislative action to discourage strategic litigation by patent owners.[4] The White House discussed the problem of patent trolls: "Innovators continue to face challenges from Patent Assertion Entities (PAEs), companies that, in the President's words "don't actually produce anything themselves," and instead develop a business model "to essentially leverage and hijack somebody else's idea and see if they can extort some money out of them."

The White House emphasised: 'Stopping this drain on the American economy will require swift legislative action, and we are encouraged by the attention the issue is receiving in recent weeks.' The Obama Administration stressed: 'We stand ready to work with Congress on these issues crucial to our economy, American jobs, and innovation'. The White House commented: 'While no single law or policy can address all these issues, much can and should be done to increase clarity and level the playing field for innovators.' However, a legislative effort to address patent trolls has stalled in the United States Senate.

In his book, *Earth Masters: Playing God with the Climate,* Clive Hamilton discusses the rise in the patenting of climate engineering.[5] He comments that 'regulation moves more slowly than commerce and in recent years there has been a flurry of broad patents taken out over methods to engineer the climate.' He observes that 'some of them are so broad that, if enforceable, they would place fertilisation of the oceans in the hands of one man.'[6]

Hamilton was alarmed by studies of patent thickets in respect of geoengineering: 'In 2010 Shobita Parthasarathy and co-authors noted a sharp increase in geoengineering patents in

recent years and warned that, as in the case of biotechnology, the patents owned by private companies and individuals are on track to become the de facto form of governance of geoengineering'.[7] Hamilton warned: 'We are approaching a situation in which international efforts to protect humanity from climate catastrophe could depend on whether or not one company wants to sell its intellectual property.'[8]

In his landmark book on climate change and philosophy, Stephen M. Gardiner considered the ethics of geoengineering.[9] He noted that 'geoengineering is a relatively new and underexplored topic' both in terms of the science and the ethics.[10] Gardiner is particularly interested in the justification that geoengineering is a 'lesser evil' required in order to 'arm the future': 'We should be wary of arguments from emergency; clearly they are open to manipulation'.[11]

Furthermore, Gardiner provides a critique of the 'arm the future' rationale provided for pursuing geoengineering, suggesting that it is less straightforward and decisive than it is usually taken to be. He suggests that issues – such as liability, compensation, political legitimacy, and lingering inertia – raise the ethical stakes in geoengineering policy.[12] The philosopher emphasises the need for caution.

Some commentators have argued for bans or moratoria regarding specific geoengineering technologies. Harvard University Professor, David Keith, has contended that the US Federal Government could ban patents in the field of solar radiation.[13] He observed: 'This is technology that allows any country to affect the whole climate in gigantic ways, which has literally potential to lead to wars'. Keith maintained: 'It has this sort of giant and frightening leverage.' He commented: 'We think it's very dangerous for these solar radiation technologies, it's dangerous to have it be privatized.' He maintained: 'The core technologies need to be public domain.'

The ETC Group has engaged in larger work on patent law and geoengineering – raising concerns about what they term 'geopiracy'.[14] The organisation states: 'As if restructuring the climate isn't controversial enough, a handful of geoengineers are privatizing the means to do so by claiming patent rights over geoengineering techniques.' The ETC Group noted that there were divisions in international negotiations over the policy settings in respect of intellectual property and climate change: 'The politics of patents has always been a divisive issue when it surfaces in different international fora'. The ETC Group argues that 'the challenge of addressing climate change highlights the need for the sound and timely evaluation of new technologies.'

The Canadian writer Naomi Klein also raises concerns about geoengineering.[15] She notes that the technology may be appealing to some: 'Geoengineering offers the tantalizing promise of a climate change fix that would allow us to continue our resource-exhausting way of life, indefinitely.' Klein is concerned about the lack of informed consent for geoengineering: 'The truth is that geoengineering is itself a rogue proposition.' Klein noted: 'While the United Nations' climate negotiations proceed from the premise that countries must agree to a joint response to an inherently communal problem, geoengineering raises a very different prospect'. She is concerned that particular countries or companies could engage in geoengineering without proper consent or authorisation from others: 'For well under a billion dollars, a "coalition of the willing," a single country or even a wealthy individual could decide to take the climate into its own hands.'

In his 2013 book, *The Future*, Al Gore is sceptical of geoengineering. He warns of the psychological problem of 'single-action bias', an ingrained preference for single solutions, even for complex problems. Gore suggests that 'this common flaw in our way of thinking helps to explain the otherwise inexplicable support for a number of completely bizarre proposals that are collectively known as geoengineering.' He fears that a number of geoengineering proposals involve reckless risks to the environment and humanity.

Gore reflects that 'our way of communicating about global challenges and debating reasonable solutions has been subjected to an unhealthy degree of distortion and control by wealthy corporate interests who are themselves desperate to prevent serious consideration of reducing global warming pollution.' He warns: 'If we continue to delay the launching of a serious multipronged global effort to reduce the emissions of heat-trapping greenhouse gas pollution, we will find ourselves pushed toward increasingly desperate measures to mitigate the growing impacts of global warming.'

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Regulatory Failure or Institutional Corruption?

The case of Food Standards Australia New Zealand and the 'regulation' of nanomaterials in food

Jeremy Tager

Let's start with a really basic proposition:

1. Emerging technologies often represent unknown risks to human health and the environment;
2. Before these technologies are introduced into the body or environment, the safety of these new technologies and products must be determined; and
3. The onus of proof rests with those who would introduce the technology or product.

This is basically the position of the World Health Organisation (WHO), which has noted that for all new materials used in food and food processing, the potential health and environmental risks of nanoscale materials need to be assessed before they are introduced into food.[1]

It is hard to imagine an argument against this and yet in the regulatory world of nanotechnology in Australia, this is not the reality. The reality instead is to assume the safety of products containing new technologies, to depend on a self-regulatory system to 'catch' problems and to regulate only as a last resort.

This piece will look specifically at the regulatory failure of Food Standards Australia New Zealand (FSANZ) in the regulation of nanomaterials in food and food contact materials, but it is a story repeated, with variations, in virtually every federal agency that has jurisdiction over nanotechnology in Australia.

The use of nanotechnology in food and food contact materials is now widespread. Nanomaterials are used as whiteners, flavour enhancers, antimicrobials, 'trickle and flow' aids. They are used in packaging, coatings, storage facilities, appliances, containers, cutlery and surfaces. They are now ubiquitous but remain invisible.[2]

The role of FSANZ is both to protect public health and to achieve a high level of consumer confidence in the quality and safety of food produce and sold in Australia and New Zealand. They are also charged with having an 'effective, transparent and accountable regulatory framework within which the food industry can work efficiently.'[3]

FSANZ hasn't been ignoring nanotechnology. They have, in fact, taken an active interest in the issue for well over five years. Yet that 'interest' is the evidence of its regulatory failure.

Government review

In 2007 a whole of government review of regulations applicable to nanotechnology was undertaken, which included a review of the adequacy of the regulatory regime of FSANZ. The broad conclusion of the review was that: "Whilst there is no immediate need for major changes to the regulatory regimes, there are many areas of our regulatory regimes which, potentially, will need amending, and this will be a long term effort across multiple regulators and regulatory agencies as nanoproducts arise and as new knowledge on hazards, exposure and monitoring tools becomes available." The review cited six important gaps that needed to be addressed if the regulatory regime was to keep up with the development of nanotechnology.[4]

A follow up review in 2012 found that these gaps were still unaddressed and were often ignored by relevant agencies.[5]

FSANZ has taken several steps in relation to the presence of nanomaterials in the food chain. It has amended its Application Handbook to 'support' new food regulations.[6]

The Handbook now contains a requirement that, "in cases where particle size is important to achieving the functionality or may relate to a difference in nutritional status or toxicity, the applicant must provide information on particle size, size distribution, and morphology, as well as any size-dependent properties."[7]

The website also notes that FSANZ has advised the industry about these amendments and asked them "about proposed nanotechnology applications."[8]

In a journal article two FSANZ staff state that FSANZ will require a risk assessment of "novel nano-particulates in the event that we receive an Application."[9]

As of June 2014, there have been no applications, and

'In theory there is a regulation but in practice it is both ambiguous and unused.'

The use of nanotechnology in food and food contact materials is now widespread.

accordingly, FSANZ is "not aware of any manufactured nanomaterials being used in food available in Australia."[10]

Nanotechnology and food

In our recent report on nanotechnology and food, 'Way too little', Friends of the Earth identified a number of products that contain nanomaterials that are available in Australia. These include Mentos, M&Ms, Cadbury's chocolate, various chewing gums and doughnuts. There is no doubt that food and food contact materials containing nanomaterials are here, but FSANZ is not looking. They appear to be waiting for the mountain to come to them.

FSANZ was asked in Senate Estimates whether they had undertaken any testing of food to determine if nanomaterials are in foods available here. The answer was no.[11]

They were asked whether they had conducted any surveys of manufacturers or importers to determine if nanomaterials were being used in food they produced or imported. They answered no.[12]

Perhaps the explanation for inaction is here. "Any new foods manufactured using nanotechnologies *that may present safety concerns* will have to undergo a comprehensive scientific safety assessment before they can be legally supplied in Australia and New Zealand."[13]

This language is much more ambiguous than that contained in the *Food Risk Analysis Journal* piece above. In light of the lack of proactive work by FSANZ it is fair to presume that manufacturers and importers make this threshold decision and if they are of the view that the food containing nanomaterials doesn't 'present safety concerns' no further action is required.

But if you do apply, we are told that foods containing nanomaterials will be subject to a comprehensive safety assessment. Or maybe not.

Even FSANZ doesn't seem clear about its own rules. "The regulatory pathway for materials with a history of use that are already approved under existing Standards, and which could be marketed with particle sizes in the nanoscale, is less certain than for new or novel nanoscale materials."[14] If FSANZ can't figure out what materials and products its safety testing rules apply to, it's pretty certain the industry won't know either – and won't be asking for clarification.

So, in theory there is a regulation, but in practice it is both ambiguous and unused despite clear evidence of nanomaterials in the Australian food chain.

Ultimately, one has to expect, someone, somewhere in a fit of paranoia or even concern, will apply for approval of a food containing nanomaterials.

What constitutes a nanomaterial?

Once that occurs, the next impediments raise their heads. There is no statutory nor agreed definition of what constitutes a nanomaterial in Australia. This extraordinary vacuum means that regulators cannot easily enforce rules relating to nanomaterials in food.[15] It means manufacturers wanting to do the right thing have no clarity regarding what materials or products are subject to these rules. Even worse, it's not clear that currently accepted tests in Australia can actually detect nanomaterials in food – and even more whether those tests would hold up under legal scrutiny. As Karinne Ludlow points out "even if the FSANZ is made aware that a nanomaterial is present, current risk assessment methodologies may not be adequate for determining potential risks of food and food contact materials containing nanomaterials to human health. For example, it is not known whether current toxicology testing techniques are suitable for nanomaterials. It is not clear that current testing methods and techniques for measuring nanomaterials are adequate for detecting nanomaterials in food and food contact materials"[16,17]

Even if we manage to penetrate the maze of red tape preventing regulation and make it to that mystical point where a safety assessment will occur, reality strikes again. As Kath Wilson points out elsewhere in this magazine, in relation to the 'safety testing' of genetically modified food, FSANZ relies almost solely on company data and has approved every single

'We have a regulatory structure designed to avoid regulation.'

GM food to pass over its desk. There is no reason to think that we are likely to see anything different with nanomaterials in food and food contact materials.

Based on the way in which FSANZ has responded to similar criticisms in the past, perhaps it will simply dismiss the regulatory sham as irrelevant as there is no evidence that any of these nanomaterials cause human health problems.

Apart from the obvious problem, that FSANZ isn't looking for evidence, the claim also isn't true.

Health concerns

There is a mounting body of evidence that suggests there are health concerns associated with some of the nanomaterials currently being used in food and food contact materials.

In particular, nano titanium dioxide, probably the most used nanomaterial in food, nano-silver, nano silica and nano zinc have all caused health problems in live animal studies.[18]

So, instead of a determination of safety, we have a regulatory structure that one could swear was designed to avoid regulation.

Perhaps we don't have regulatory failure but what Lawrence Lessig describes as institutional corruption. In response to 'agents of influence', agencies begin to act on behalf of interests other than the public interest. They embrace assumptions about markets and business and innovation and reorient themselves in subtle ways to support the industries they are supposed to regulate. The regulations themselves are designed to catch little or nothing. Lessig says that one can see institutional corruption not in the processes in place but in what he calls the ordinary outcomes of those processes. The ordinary outcome here is that despite 6 years of 'regulation' no foods or food contact materials containing nanomaterials are actually regulated.[19]

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Public engagement and the National Enabling Technologies Strategy

Georgia Miller

Nanotechnology marks one of the first times where 'upstream engagement' has become a central part of government technology policy in many OECD countries, including Australia. Joly and Kaufmann define public engagement as "a form of two-way communication between the public and those who have knowledge of, or power over, the particular issues at stake". Yet the extent to which government-backed engagement can be seen to support two-way communication or to give wider publics a greater voice in decision-making has been contested, including in relation to the Australian National Enabling Technologies Strategy 2009-2013 (NETS).

Greater public involvement in science decision making has been called for a range of reasons: to open up decision making processes to people who are affected by them; to improve the quality of knowledge and decision making – especially in conditions of scientific uncertainty; and to boost the perceived legitimacy of assessment and regulatory processes. These goals can in principle support a greater democratisation of science. Yet it's also true that engagement can serve narrow political aims. Many governments' nanotechnology engagement programs have had the stated objective of promoting public acceptance of both publicly funded investment in the new field, and its commercialisation.

In Australia, government-backed 'awareness' and 'engagement' activities on nanotechnology formed a central part of NETS. A full quarter of the $38.2 million budget went to the Public Awareness and Community Engagement (PACE) wing of NETS. NETS-PACE activities included public meetings, invitation-only workshops, school educational materials, opinion surveys, focus groups, Avant card campaigns, newspaper inserts, web-based initiatives, and the publication of fact sheets and booklets. Sometimes the wider community was the focus of the engagement, other times the engagement was promoted as a dialogue for government, industry, research and community 'stakeholders'.

The turn towards public engagement is usually contrasted with the 'deficit model' of the public understanding of science that preceded it. The deficit model suggests that whereas experts understand the 'reality' of scientific risks, public perceptions of risks often result from public irrationality, or ignorance of the scientific 'facts'. The deficit model assumes that public unease or ambivalence about the development and deployment of science and technology can be overcome through greater public 'education'.

In social science circles, the deficit model has been widely discredited; it is now recognised that expert knowledge is both fallible and affected by social judgments, and that lay knowledge also has value. Public concerns about science and technology oversight are seen to reflect not ignorance of scientific 'facts', or even a preoccupation with safety risks, but rather concerns around the purposes of development, alternatives and the availability of choice, and the trustworthiness of scientific institutions. Nonetheless, the deficit model has staying power in parts of the science community and in government.

Traces of the deficit model were clearly apparent in the NETS-PACE program. Some NETS documents suggested that whereas the Strategy would have an educational focus, it would also support two-way dialogue. Yet a discussion paper issued to support the Strategy emphasised the dominant role to be held by technical experts and regulators, and the intended one-way flow of information: "the Public Awareness and Community Engagement Program would have a clearly defined goal of providing balanced and factual information to support evidence-based policy and regulatory practice, and to increase community awareness and understanding of nanotechnology and biotechnology issues".

Whereas the 'participatory turn' of recent science and technology policy debates has been heralded as an important, if rhetorical, shift in the relationship between science and society and the rationale for science governance, there is ongoing debate about the extent to which it offers meaningful opportunities for public involvement. Kearnes and Wynne have suggested that the institutionalisation of engagement may be introducing a new deficit model, where the deficit to be overcome through engagement is now that of trust in experts and in science governance, or even of enthusiasm for technology itself.

In nanotechnology debates and engagement events supported by NETS-PACE, there was a persistent failure of scientific and policy institutions to recognise that their own cultures, assumptions, purposes, practices and inconsistencies may contribute to public mistrust. There was a strong focus on 'the science' in regulatory debate, and little willingness to recognise the political choices at the heart of nanotechnology decision-making. Despite stated commitments to 'dialogue' between science and society, NETS engagement events and materials often constructed the public as 'consumers', while shielding

The public should not just be passive consumers of new technologies.

'scientific experts' from having to examine how politics and value judgments shaped their own work.

The engagement activities that took place under NETS and earlier programs have been criticised by some social scientists and community groups as tokenistic and even manipulative. Lyons and Whelan evaluated government-backed public engagement on nanotechnology and concluded that it was designed to facilitate, legitimate and accelerate the development of the nanotechnology sector. An independent evaluation of materials produced by NETS-PACE, and a series of events NETS organised, found that many materials were biased or promotional in tone. Inaccuracies were also found in several materials. The review was more complimentary about the (now terminated) NETS Science and Technology Engagement Pathways (STEP) framework, which was then in its early stages.

The STEP framework explicitly aimed to create a space for multi-stakeholder dialogue, underpinned by seven jointly agreed engagement principles. The framework won an award for its organisation, despite criticism from participating community sector organisations. Nonetheless, as with engagement activities elsewhere, STEP was constrained by the political program and circumstances it operated within. There was little apparent high-level political interest and no indication that the output of STEP dialogues would shape the objectives or actions of the government.

A key criticism of state-backed engagement initiatives has been their lack of connection to the decision-making process. There are rarely – if at all – explicit links between public engagement and decision-making within government, industry or the scientific community. Yet Andy Stirling stresses that technological change and decision making is diffuse, and that a focus on engagement informing formal decision points may be misguided: "important political choices over alternative directions for innovation are made at every juncture". Similarly, Brice Laurent suggests that we should consider "within the same analytic gaze" initiatives routinely considered as participatory or engagement-based (e.g. public meetings or debates) alongside those that are typically not (e.g. technical standards development or commercial grant giving) and to "make explicit the political constructions they enact". Why simply focus on what goes on in the room when we're supposed to be 'engaging', rather than the rest of the time – when routine and arguably higher impact decision-making is taking place?

In an online forum, a former employee of NETS-PACE stated that it should not be too surprising that in the materials and engagement events it produces, the Department of Industry would aim to promote industry objectives. This goes to the heart of the constraints of the NETS-PACE program. The Australian government is a key stakeholder in nanotechnology's development, and a major funder of research and development activities. In these circumstances (which are typical of government-backed nanotechnology engagement initiatives internationally) the options for opening up the assumptions and commitments of government to critical scrutiny and reframing may be limited.

What potential government-backed engagement programs on science and technology policy have to contribute to greater democracy and social accountability remains an open question. In an optimistic analysis, engagement programs could create the possibility for recognition of alternative sources of knowledge, for fresh critical views to inform science and technology decision-making, and ultimately for the enrichment of scientific culture and the politics with which it is intertwined. Yet that has not been the experience with nanotechnology to date. This reflects not just industry or commercial pressure, but rather the commitment of much of government to a certain vision of technology futures; the interlocking network of interests driving nanotechnology development (industry, research community and government); and the privileging of certain kinds of knowledge and expertise. The ongoing challenge will be to open up for critical scrutiny the politics not just of invited engagement, but also the broader process of science and technology decision-making.

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The use of techno-utopian narratives to further corporate control

Jeremy Tager

Techno-utopianism (n.) – any ideology based on the belief that advances in science and technology will eventually bring about a utopia, or at least help to fulfil one or another utopian ideal.[1]

It is tempting to dismiss techno-utopian views as the realm of fringe dwellers – largely irrelevant to the workings of the world. After all, techno-utopianism has been around an awfully long time with not a lot of utopia to show for it.

The view that technology will solve all political, social and environmental problems and save us from ourselves is a profoundly religious view cloaked in the products of technology and language of science. It is 'magical thinking'2 that ignores the realities of power and who develops and controls the use of these technologies.

Techno-utopianism is not new, but the 20th and 21st centuries have seen the development of technologies that are unprecedented in the power they possess and the risks they create. This is accompanied by an unprecedented level of control over those technologies resting in the hands of corporate and commercial interests. These emerging technologies may not only fundamentally change our relationship with the planet but may fundamentally change what it is to be 'human'. All this makes the current 'brands' of techno-utopianism different and more dangerous.

Techno-utopians see technologies – such as biotechnology, nanotechnology, artificial intelligence and synthetic biology – and their convergence – as leading to the next utopia, this one a post-human or transhuman world in which we have not only transcended nature but ourselves. Princeton University techno-utopian Lee Silver sees development of 'a special group of human beings' who will trace their ancestry back to homo-sapiens.[3]

Others see "the potential to recapitulate the course of natural genomic evolution, with the difference that the course of synthetic genomics will be under our own conscious deliberation and control instead of being directed by the blind and opportunistic processes of natural selection."[4]

A similar hubris and spirit of dominance characterises other emerging technologies such as geoengineering, where the techno-utopians see global scale engineering of the climate as little more than an engineering problem.

The real driver of techno-utopian claims

While techno-utopianism is the fascinating and somehow perverse face of new and emerging technologies, the reality is that it is not the driver. Look beyond the surface of eternal life, designer babies, controlling the climate, freedom from disease and we see a familiar man in a familiar suit hiding behind a familiar curtain. Corporate interests, not surprisingly, are the force behind the hype and their motivation isn't utopia but the more mundane incentives of money and power.

The roll-out of genetic modification (GM) and nanotechnology are both good examples of new technologies rife with utopian claims and visions. Both are fundamentally characterised by rapid commercialisation and corporate control of the products and intellectual property that underpin the technologies. The commercial reality – particularly of nanotechnology, which is commercialising far faster and penetrating a range of markets that GM hasn't achieved – is also characterised by a strange silence. The hype for nanotechnology is almost exclusively at the visionary level. Food, chemicals, clothing, sporting equipment, energy, medicines, cosmetics etc. are flooding into the market without even being identified as containing nanomaterials – much less hyped as products that will transform your life.

There are several different narratives at work here. We have a narrative that tells us that we have a wonderful new technology that will solve a host of social and environmental problems. We have a more extreme techno-utopian narrative telling us that this technology will transform our lives in unimaginable ways – and then we have the unspoken story of business as usual. At the moment, the only story that is real is the one accompanied by silence. The business of new technology is business. Corporate interests – largely responsible for the social and environmental problems that new technologies promise to solve – are doing what they've always done – producing, marketing and selling a host of products and ideas, the vast majority of which we can and should live without.

'Corporate interests are the force behind the hype.'

That said, techno-utopian visions do serve an important purpose. In the marketplace these visions propagate a kind of endless promise. This is the technology that, like IT, will be the growth industry of the future, the next industrial revolution, the next revolution in food or energy or medicine. Investors are attracted. Scientists are attracted. Students are attracted. Industry may use and even depend upon techno-utopian visions to drive broad support for their technologies, but in the end they don't seek or need utopias themselves.

Industry has learned some important lessons from the attempt to force GM on the population. Initially, industry believed that GM would be greeted with open arms. They were wrong. The techno-utopian views of those in the biotech world weren't broadly shared and weren't sufficiently attractive to sell actual products, such as GM tomatoes. As soon as the vision was put in products, such as food, it was no longer a vision, it was a weird and scary manipulation of nature and an immediate risk to human health. They have not made the same mistake with nanotechnology.

The role of government

It is in this space – the distrust of corporations and the new technologies that they sell, that we can see the varied role of government in facilitating and supporting these new technologies and the techno-utopian brand.

Devotion of successive governments to extreme views of neoliberalism and free markets are ideally suited to make government a handmaid to industry in the protection and promotion of new technologies. As one investigates the role played by government in emerging technology it is clear that ultimately their role is about markets not individualism and not utopia.

That said, techo-utopian views are common in government across the political spectrum. There are some simple reasons that new technologies attract. Politicians look for easy solutions to complex problems and technological fixes are an easy 'solution'. Governments also look for solutions that are driven by markets and emerging technologies are market based.

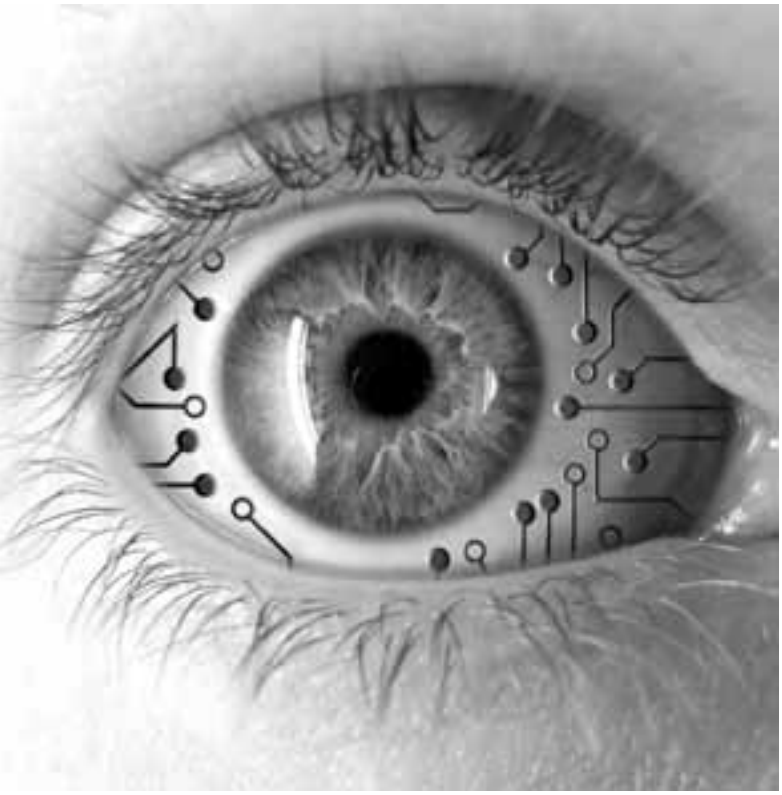
As then Minister for Innovation, Kim Carr, put it in 2010: "We rely on science to power new industries, to create new jobs, to cure disease, to meet our needs for sustainable energy, to feed the world, and to bring new levels of comfort and convenience to our lives…Science has the power to solve most of the problems we face."[5]

Perhaps too, emerging technologies, such as geoengineering, offer politicians an opportunity to reconcile the irreconcilable – to see technology as providing the mechanism by which endless growth and sustainability will be achieved.

Both Liberal and Labor Governments have embraced new technologies within the context of the neoliberal world view. The traditional story is that innovation – in other words technology – creates new industries, economies and economic opportunities. Government functions relating to emerging technologies are less utopian than techno-optimistic and profoundly attached to the neoliberal ideology. While innovation is supported, precaution and regulation are not. In fact, any intervention is avoided. The extreme neoliberal view that regulation is an impost on freedom meets the extreme free market ideology that says that the market solves all problems.

There is no shortage of examples of the ways in which government supports emerging technologies but utterly fails to ensure they emerge in ways that serve the public good.

One of the most profound steps has been the privatising of science. This has involved fostering the entrepreneurial university and research institute by reducing public funding; creating incentives and funding for public private partnerships; relaxing rules relating to commercial activities of universities and staff; changing IP rules at universities; linking policy outcomes to privatised processes and more generally demanding that universities become virtually commercial entities.[6]



'Government supports emerging technologies but utterly fails to ensure they emerge in ways that serve the public good.'

Unfettered innovation is actively endorsed. When regulation becomes necessary, as it did with GM plants and foods as a result of public pressure, then regulations are implemented in ways that limit intervention and limit the right of the public to challenge such decisions. These regulations generally assume the safety of the technology and give an appearance of safety testing to ease public concerns. We are still waiting for regulatory intervention with nanotechnology, despite pervasive commercialisation.

Agencies such as the Office of the Gene Technology Regulator (OGTR) or Food Standards Australia New Zealand (FSANZ) thoroughly embrace the technologies they are supposed to regulate. Neither FSANZ nor the OGTR has ever rejected an application for approval of a GM food or the planting of a GM crop. If contrary peer reviewed science is published that calls into question an approval that has been granted, FSANZ will often publish an online a repudiation of that science, without bothering with peer review. On the other hand, they accept industry funded science and data in granting approvals, despite the mountain of science that says such data is far more suspect than data produced by independently funded scientists.

Governments also use a variety of other regulatory and policy instruments to remove obstructions to corporates – including international mechanisms. Intellectual property rules, for instance, are deeply anti-free market, but successive Australian Governments have supported strengthening IP rules in ways that strengthen corporate control over both products and knowledge. There is evidence that IP laws – particularly the free for all of the current system – results in less innovation, but IP must be seen as a mechanism of power and control not inventiveness.[7] Clearly, when neoliberal ideology and techno-utopian visions don't quite fit, they are quickly abandoned in favour of corporate interest.

Technology itself is not the problem

The impulse to respond to techno-utopian visions is ultimately the wrong game. Technology is generally neutral. However, the technologies we choose, why we choose them, who chooses, and how they are assessed, developed, produced, marketed, sold and regulated are not neutral issues. It is these mechanics that demonstrate that the development of emerging technologies is being primarily being driven by corporate interests.

It is this reality too that makes techno-utopianism dangerous. While corporate interests may have no particular interest in seeing techno-utopian visions becoming real, they also have no particular interest in stopping those individuals determined to make their transhumanist visions real. Some of these individuals, such as Raymond Kurzweil, appear to have both the skills and resources to push those visions forward. Without the intervention of governments, these technologies may be developed by both corporations and individuals in ways that are untested and uncontrolled.

Under such circumstances, it is hard to believe that these technologies will be used to solve real problems. More likely, they will simply further entrench existing models of consumption, greed, dominance and private interests.

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Mukwano Australia
Supporting health care in organic farming communities in Uganda.
website: www.mukwano-australia.org
email: Sam Le Gassick
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Kristen Lyons, kristen.lyons@uq.edu.au

Reverse Garbage Co-op (Bris)
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postal: PO Box 5626,
West End, Qld, 4101
phone: (07) 3891 9744
email: info@reversegarbage.com.au
website: www.reversegarbage.com.au
Office days:Mon to Fri

Sustainable Energy Now (WA)
address: Perth. PO Box 341,
West Perth WA 6872
phone: Steve Gates 0400 870 887
email: contact@sen.asn.au
website: www.sen.asn.au

Tulele Peisa (PNG) –
'sailing the waves on our own'
website: www.tulele-peisa.org

West Mallee Protection (SA)
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No Fracking WAy (Perth)
email: info@nofrackingway.org.au
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National campaigns, active issues, projects and spokespeople

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emnail: robintaubenfeld@hotmail.com

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phone: 0402 337 077 (Shaun Murray (Melb))
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email: jeremy.tager@foe.org.au

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Indigenous Communities Campaign – food sovereignty – No Multinationals – Mt Nancy town camp:
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Emerging Technologies:
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phone: 0400 376 974 (Jeremy Tager (NSW))
email: jeremy.tager@foe.org.au
website: www.emergingtech.foe.org.au

Nature: Not Negotiable –
Stop the Commonwealth handing over environmental approvals powers to state governments:
website: foe.org.au/nature-not-negotiable,
facebook: facebook.com/NatureNotNegotiable,
Twitter: @NatureNotNeg

Pacific & Torres Strait Islands Climate Justice:
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Pesticides & Water:
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Renewable Energy:
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