

Futurewatch

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An information service of current perspectives on our futures, prepared by futures scanner, **Jennifer Coote**. Annual dates in last two digits.

ECONOMIC/BUSINESS

The Meltdown

G. Soros, *The New Paradigm for Financial Markets: the Credit Crisis of 2008 and What It Means*, Public Affairs, 08, argues that three trends were contained in the current super-bubble. A long-term trend towards ever-increasing credit expansion, globalisation of financial markets and the progressive removal of financial regulations. Underlying this is the belief that markets tend towards equilibrium, even as each "bubble" is misinterpreted and the problem intensifies. A sounder theory utilises reflexivity, the relationship between thinking and reality, leading to the following conjectures:-the sixty year period of credit expansion centred on the US, has ended; regulators will regain control over banking and investment depending on the severity of the crisis; global contraction of credit depends on the countervailing influence of China, India and some oil states; US power has declined dramatically through poor political leadership, and this will be reinforced by a US recession; a great period of uncertainty and destruction of financial wealth will result before a new order emerges.

London School of Economics Professor **R. Wade**, *Challenge July-August, 08*, examines the first-world debt crisis of 2007-2010 and suggests some regulatory responses. Financial firms need to be on the same footing as drugs, tobacco and explosives. A global norm is required which positively correlates debts with ability to repay. New financial instruments such as GDP-linked bonds could be devised. The Basel 2 capital equity accord could be hard-wired into a counter-cyclical capital requirement and Basel 3 should shrink the scope for self-regulation and require governments to tax the banking system. International Accountancy Standard 39 needs to be revised to remove pro-cyclical effects. A change is needed in global norms to permit capital controls on inflows and outflows either in the form of quantitative restrictions or taxes. National financial regulation, especially for the US, needs to be joined up and a wider range of organisations brought within the regulatory scope, especially hedge funds and investment banks. Banks need to be mandated to backstop the financial system in a crisis and also curb the momentum towards a crisis. Overall the banking and finance sector should be reformed to create a mixed economy with some financial firms having a large component of public ownership or public guarantees. Finland and France provide models with

their co-operative banks. If the costs of capital rise as result, that reflects that it also carries risks.

US venture capitalist **E. Janszen**, *The Independent (NZ)*, 21 August, 08 pp.6-7, argues that the present US government policy could stimulate another bubble in an economy dominated by the finance, insurance and real estate industries (FIRE), even as it lowers taxes which would finance needed infrastructure development and the economy as a whole. He argues in a forthcoming book **The New New Deal: Re-industrialisation of Post Depression America**, that the way out of the current stagflation is to remove the government subsidies to the FIRE sector. The resulting funds should be applied to tax cuts to boost the productive, innovative capacity which will benefit national exports and regain a productive place in the global economy.

Rogue Economics: Capitalism's New Reality, **L. Napoleoni**, Allen & Unwin, 08. An Italian economist and money laundering expert examines the black and criminal markets and unregulated grey areas. These flourish in times of political upheavals, for example, in the post-communist transition in the East European countries. The operations of this underworld are hidden by the official illusions of the "market matrix."

Economic Ideas

Common Wealth: Economics for a Crowded Planet, **J. D. Sachs**, Penguin/Allen Lane, 08. To achieve a sustainable use of energy, land and resources humanity must evolve to meet the challenges ahead. Stabilizing the global population is a major plank. Sachs surveys the statistics, the challenges and the global institutions, and offers optimistic strategies, utilising both technologies and human co-operative effort. The Millennium Development Goals are vital in the elimination of poverty, and fundamental to social stability.

Future Directions for Heterodox Economics. Eds **J. T. Harvey**, **R.F. Garnett Jr**, Univ of Michigan, 08. Two US academics provide studies of the many theories and communities of practitioners of the alternatives to mainstream economics. These include:- ecological, feminist, Austrian, Marxian-radical, institutional evolutionary, Post Keynesian and social economics. While standard economic theory has become more concerned with simplified assumptions such as perfect competition and can be criticised for becoming divorced from the real world, most heterodox economists are concerned to make the world a better place.

J. Madrick, *Challenge*, Nov-Dec 07, examines the contribution of prevailing economic theory which has contributed to the diminished role of government in economic growth. For an economy to work well for all, government needs to retain a vigorous presence. A richer theory of economic growth, which is demand-led, would include high levels of public investment in public goods such as universal, early education; self-sufficient energy supply and improved transportation, a reformed and improved health service and support for full employment and minimum wages.

B. Gates, "How to Fix Capitalism", *Time*, 11 Aug 08, enthuses that capitalism has improved the lives of billions of people, but has left out billions more. It will take too long for governments and non-profits to overcome this unless corporations, by becoming creative capitalists, pitch in. This stretching of market forces is already

operating but with a nudge from activists such as Bono, more can be done. Corporations can find opportunities such as innovative systems using cellphones in Africa, or they can be facilitated by non-profits and governments.

Mobilizing Science-based Enterprise for Energy, Water and Medicines in Nigeria, US National Academies and Nigerian Academy of Science, 08 reported *Science*, 25 January 08, p.385, examined the potential for a sustainable approach to supplying basic services by encouraging private companies to become involved. Business models, cost estimates, and the potential for the local market to gear-up to supply equipment were examined. It was concluded that business could supply such resources as small-scale photovoltaic systems, low-cost water filtration systems and malaria drugs, while operating profitably. Government incentives and educational campaigns, plus shifts in the strategies of donor organisations, are required.

Creating a World Without Poverty: Social Business and the Future of Capitalism. M. Yunus, Public Affairs, 07. The founder of the Grameen bank argues that unfettered markets have failed to solve social problems and may exacerbate social ills, while non-profits cannot be expected to fill the gap. Another capitalist structure is needed; a business which is set up by entrepreneurs less for personal gain than for specific social goals. The bottom line for such a business is to operate without incurring loss while serving the people and the planet. Two kinds are possible: one which provides a social benefit such as poverty reduction, or health care, and a profit-maximising one which is owned by the poor or disadvantaged, not necessarily for social benefit.

Just Another Emperor: The Myths and Realities of Philantrocaptialism, M. Edwards, Demos/Young Foundation, 08. A leading development analyst takes a critical, comprehensive look at this innovative approach which is likely to be highly influential. The hype runs ahead of the ability to deliver results and merges civil society with business thinking, undermining democratic politics.

Two leading UK researchers and academics connected with the Royal Society for Encouragement of the Arts, Manufactures and Commerce, **M. Prescott, M. Taylor**, *World Policy Journal*, Spring 08, argue for a policy of personal restriction on carbon emissions to complement industrial cap-and-trade emission policies in the EU. Each citizen would be allowed an equal number of credits which could be surrendered electronically for the purchase of fuel and energy. Those using less could trade with those needing more. Such a proposal would be better applied in local communities than across international borders. It is an educational device which would need to be flexible and encourage learning and experimentation.

Listings

The China Price: The True Cost of Chinese Competitive Advantage, A. Harney, Penguin, 08. This financial journalist's analysis of the way China had become the workshop of the world to the immense benefit of billion of its people also shows the downsides, socially and environmentally. Some of China's advantages are eroding with rising wages and material costs, a dwindling supply of cheap workers, stronger calls for product quality and safety, along with downward pressure on profit margins. Some business circles are devising a China-plus one strategy, with another

country as hedge for additional operations.

Making Monetary Mischief: Using Currency as a Weapon, J. Liss, *World Policy Journal*, Winter 07/08. Though rarely talked about, this method for maliciously creating political turmoil, especially against an emerging country, hovers in some international dealings. It has been used, notably in Nigeria 's civil war against Biafra, 1967-70.

ENVIRONMENT

Climate Change

The Nitrogen Cycle

Nature 17 Jan 08, *Special Feature* to mark Year of Planet Earth 2008, a joint initiative of UNESCO and International Union of Geological Sciences, environmental scientists **N. Gruber, J. N. Galloway**, examine an earth-system perspective on the global nitrogen cycle, the critical relationship between nitrogen-carbon-climate interactions, and the question of how availability of nitrogen will affect the capacity of Earth 's biosphere to continue to absorb carbon from the atmosphere. The expected population increase is likely to double the turnover rates of the nitrogen in the Earth 's systems, with consequent acceleration of eutrophication of terrestrial aquatic systems, global acidification and stratospheric ozone loss. Already data from Earth's past records indicates that human impact on these systems has pushed into territory never seen on Earth for 650,000 years. Already it is clear that the potential huge impact must be limited by reduction in burning fossil fuels.

Forests

In June 08 scientists and policy makers were to meet and work out how to manage the world's tropical forests, *Nature*, 6 March 08, pp.8-9. The Bali Climate Change agreement late 07 had placed deforestation on the agenda for a future global warming treaty. Old divisions emerged over whether to integrate forestry issues into a cap-and-trade emissions agreement, or to treat forestry separately through government programmes. Questions arise as to whether markets are suitable mechanisms for such forestry conservation. Sceptics are especially concerned that developed nations can pay forestry credits and do little to reduce their forestry consumption. Developing nations such as Brazil and Indonesia want firm commitments backed with adequate resources, to help conserve their forests instead of making profits from them.

F. Pearce, *New Scientist*, 11 Dec 07, pp.40-43 reports that in parts of Indonesia where tropical forest has been cleared to create vast palm-oil plantations, a rich release of greenhouse emission is resulting as great peat bogs beneath the forest are drained. It is estimated that about 30% more such gas is released than might be saved by the plantation. Further environmental hazard is created if the peatland is fire-cleared, because the resulting brown cloud swathes much of S.E. Asia, contributing to Himalayan glacier melt.

Our Forests, Your Ecosystems, Their Timber: Communities, Conservation, and the State in Community-Based Forest Management, N. K. Menzies, Colombia Univ. Press, 07. It is estimated that in 2002 some 11% of the world's forests were under some form of community-based ownership. This study examines several of them in China, Zanzibar, Brazil, India, Mexico, Nigeria, Quebec and Oregon. Here, the relationship between states, communities and other interests are reconfiguring sustainable use and environmental protection with ethical concerns for social justice, human rights, local interests and improved livelihoods.

Climate Change and Forests: Emerging Policy and Market Opportunities, Eds C. Streck et al, Brookings, 08. This wide range of scholarly contributors argues that forests are one of the sectors less regarded in the policies to combat climate change but they offer one of the cheapest mitigating options. An effective post-Kyoto agreement must include a comprehensive accounting system which establishes incentives to reduce emissions from deforestation.

Asia

The Himalayas, the largest store of global ice after the Poles, are melting fast, as 82% of the glaciers have retreated in the past half-century, *Nature*, 24 July 08, pp.393-396. Rising temperatures have been increasing here three times as fast as for the planet overall. At the current rate over 60% of the glaciers will be gone by 2050. Retreating glaciers leave residual lakes behind dams of debris, creating major natural hazards. Of greater long-term concern is the eventual catastrophic fall in the melt water which feeds the major river systems which run though to China, S.E. Asia and Asia. The alpine ecosystems will be severely degraded as the permafrost becomes unstable in higher temperatures, releasing far more greenhouse emissions, while there is suggestion that warming could severely weaken the annual monsoon. Much more data is needed.

The Economist, 7 June 08, pp.27-30, reports that China and India are beginning to face the realities of climate change and the need to develop and implement plans to meet the challenges, as studies suggest that they are rising to the top of the list of climate change emitters. Both have released policy plans, with China in particular, attempting to reduce fossil fuel consumption and boost use of renewables. Both have success with recent home-grown alternative energy-companies.

Updates

F. Pearce, M. Le Page, *New Scientist*, 16 Aug 08, pp.26-30, report on shorter range forecasts on climate change effects for the next decade. Based on underlying trends of warming caused by increases in greenhouse gases, there are likely to be fluctuations because the oceans take a long time to heat up and to cool down. They are crucial because they store so much heat. Droughts in Australia could be due to the persistently low sea surface temperatures north of the continent, which may be the result of the changed phase of the El Nino-Southern Oscillation, which may have a long term moderating effect on rising temperatures. A similar Oscillation in the Northern Pacific, the Pacific Decal Oscillation, (PDO) has changed its phase since the late 1970's and may also be contributing to prolonged droughts. The rapid warming in the

Arctic recently may be strongly influenced by another Oscillation in the N. Atlantic, which changed phase in the 1990s, affecting the rainfall in the Asian monsoons, in West Africa and possibly also enhanced hurricanes in the Atlantic. Changes in the phasing of the PDO could slow the rapid Arctic warming, increase drought in S. Asia, the Sahel, while increasing rain in the American Midwest.

Research reports, *Science*, 15 Feb 08, p.889, offer a brighter prospect for determining the role of clouds in understanding of greenhouse warming, which has been uncertain for over two decades. Clouds respond to increases in greenhouse gases far more quickly than had been anticipated, making modelling much more reliable.

What To Do

The Hot Topic. G. Walker, D. King, Bloomsbury/Harvest Books 08. A forceful, engaging, simple-format overview on climate change for the general reader. The two specialists provide real depth and insight in the later section which examine the politics involved and the range of solutions.

Carbon Neutral by 2020: How New Zealanders Can Tackle Climate Change, Eds N Harre, Q. D. Atkinson, Craig Potton Publishing, 07. This wide ranging NZ selection covers much of the usual range of topics, with specifics for groups such as schools, the Auckland transport system, malls, investing, political activism, computers and the psychological challenge.

Climate Change and Adaptation, Eds N. Leary et al, Earthscan, 08. Adaptation is essential if we can hope to limit harm, is the message from this wide range of case studies drawn from over a hundred and fifty countries, ranging through , from Africa, China, the Pacific, and Latin America. Five general lessons:-Adapt now; Create enabling conditions; Integrate adaptation with development; Increase awareness and knowledge; Strengthen institutions.

The Economist, 6 Sept, 08, pp.90-92, reports that a Royal Society series of studies outline options for possible experiments to determine if geo-engineering could buy time for the transition to a low carbon economy. Possibilities include the removal of excess carbon dioxide from the atmosphere, by reducing the amount of sunlight reaching the ground using iron to fertilise the plankton in the oceans. This can certainly accelerate planktonic bloom, but it is not clear what happens to the carbon dioxide. Or the greenhouse gas could be recycled as fuel by reacting it with hydrogen, but that hydrogen must be generated without more emissions. Or carbon dioxide could be ejected from the atmosphere at the Poles using the Earth's magnetic fields, and steered by finely tuned radio waves. Other possibilities include using Space, or making clouds more reflective.

Water, Water...

Australasian Science, Aug, 08, p.14, reports that recent research has clarified a long-standing discrepancy between the observational data and models of global warming. It confirms that over the past four decades sea-levels have been rising, along with ocean temperatures, and both have been 50% greater than the estimates.

R. J. Diaz, D. Rosenberg report, *Science*, 15 Aug, 08, that dead zones, where oxygen has been exhausted, are spreading in marine ecosystems. Increase in primary production using fertilisers and the burning of fossils fuels have caused this, with serious effects for over 400 systems. The coasts of N. America, Europe, but increasingly E. Asia, S. America, the Middle East and Australasia, are chiefly affected. Climate change is though to probably exacerbate the problems in a number of ways. Reduction of nutrient use to the levels of the mid 20th century would alleviate the problems.

Water & Atmosphere, (National Institute of Water and Atmosphere, NZ), Vol 16/1, 08 reports that The Census of Marine Life is "the most comprehensive research programme on ocean biology". Two thousand researchers from 80 nations have divided the oceans into various realms for 14 field studies, from abyssal trenches to the poles, tropical reefs, and planktonic and microbial ecosystems. New Zealand is crucial part of the Census, as host to the study on seamounts. Like many of the other realms, little is known compared with what needs to be known to promote the health of the oceans and marine life.

Scientific American, Aug, 08, feature on **The Freshwater Crisis**, **P. Rogers**, warns that investment in new and current technologies is needed at a rate of US\$ 1trillion annually to meet requirements through to 2030. Otherwise three quarters of the world's population could face scarcities. Five solutions are outlined:-Financial fix, more investment in water conservation, not waste; Agricultural action, a 10% drop in irrigation wastage would pay off hugely; Plumbing action, such as use of dry composting toilets; Proxy Trade remedy, in "virtual" water, as countries in climates marginal for crops trade with those with sufficient water to grow more crops; Supply-side; exploit advanced desalination technology, such as reverse-osmosis carbon nanotube filters. For details of innovative approaches to desalination, see *Nature*, 20 March, 08, pp.260-261.

Financial Times, April 4, 08, p.7, argues that water is priced far too cheaply, especially in the developed world. Consequently there is global trade in "virtual water", with Australia by far the largest exporter in wheat and other crops. Consumers do not notice the real costs of producing their food because of heavy agricultural subsidies. Some countries such as India, are jeopardising future supplies of underground water. Fairly priced, cap-and-trade systems for water use could work, with allowances for basic human needs and infrastructures to provide local access to water.

Our Common Future

E. Ostrom, *Environment*, July-Aug 08, summarises the impacts of the original 1987 seminal study "**Our Common Future**" and later reviews, including the 2000-2005 Millennium Ecosystem Assessment of the state of the world's ecosystems and their services. Overall, the problems remain and will seriously diminish future prospects for future generations. Questions remain about what "the commons" really means, and also how to manage and improve them. Lessons learned since 1987:- simple panaceas, at whatever level, may work in some settings but fail in others because ecosystems are diverse, policies must be tailored to local situations and environments and combined with effective monitoring. Five basic requirements for governing the diversity of "the commons":- achieving accurate and relevant information; dealing

with conflict; enhancing rules of compliance; providing infrastructure and encouraging adaptation and change.

Environmental Principles and Policies: An Interdisciplinary Introduction, S. Beder, Earthscan, 06. An Australian social science academic discusses six principles: - Sustainability; polluter pays; participation; precautionary; equity; and human rights. Additionally, measuring environmental value, monetary evaluation and economic instruments are related to these. The principles are applied to policies. She concludes that there is fundamental divergence between the goals and assumptions underlying economic-base principles and the social principles which concern communities and governments.

Dirt: The Erosion of Civilizations, D. Montgomery, Univ. Calif. Press, 07. A US geomorphologist argues that soil is fundamental to the survival of a culture but today it is being exhausted at a faster rate than it is being replenished because of population pressures and the shrinkage of the land base. Technological know-how is not enough because the soil needs to be treated as an investment under international stewardship.

FUTURES THINKING

Futures of Feminism

In this issue of *Futures*, May 08, which features a range of contributors, several of them from Australia, guest editors, **I. Milojevic et al** invited consideration of such issues as the distinctiveness of women's way of knowing, the core of feminist thinking and values, the challenges to these, the preferable vision from the women's movement and women futurists, common themes from feminist utopian and science fiction, as well as the current trends globally and locally which are impacting on women.

The Editors survey the contribution of feminism, especially the "Golden Age" decades post-1960 and its legacies in the categories of gender and patriarchy for social systems study, together with the preferred alternative of the gender-equal society. They also consider the impacts of change in democratic societies, in communications technologies and women's working lives. Feminism is still crucial to futures. Contributors explore current alternatives to patriarchy worldwide, the changes in US families and parenting, the role of values-consciousness in theory and in the practicalities of women's lives, contemporary film images of the future from an eco-feminist perspective and an understanding of time which reveals the values in women's way of knowing. A highlight article features extensive conversations with twelve women futurist from around the world and across several generations. Finally, a review of a recent book on notable feminist and peace researcher/practitioner, **Elise Boulding: a Life in the Cause of Peace, M.L. Morrison**, McFarland & Co, 05.

From Vision to Decision

Mana, Aug-Sept 07, features an extract from **Resistance - an Indigenous Response to Neoliberalism, Ed M. Bargh**, Huia, 07, the story of the historic Wai 262 claim to the Waitangi Tribunal, finished 2007, decision awaited. In 1991 this claim arose from the vision of Maori elders concerned at the loss of native flora and fauna

overseas, aggravated by the lack of Maori involvement in decision making about granting of intellectual property rights over these and other aspects of a Maori language and culture where regarded by Maori as taonga (treasures). The claim is based on the historic guarantee under the 1840 Treaty of Waitangi, to protect Maori worldview, culture and identity. Internationally Maori language as well as the flora and fauna have been appropriated and even trademarked indiscriminately, without reference to Maori. A German company threatened a Maori performing artist because her own birth name had been trademarked by the company. Wai 262 seeks to establish a process based on Maori custom to protect Maori taonga, in partnership with the Crown and other interests. It will also be an historic achievement for other indigenous culture.

J. C. Camillus, Univ. of Pittsburg, *Harvard Business Review*, May 08, analyses his research into how companies manage wicked strategy problems. Companies have been slow to admit the wickedness of these, not because the problems are intractable but because they are so complex, with innumerable causes. It may not be possible for the company alone to solve the wicked problem. Such a problem has many stakeholders making social complexity a key challenge because different values and priorities are involved. It is unprecedented with complex causes and there is nothing to provide the right answer. Companies need to start by defining their own identity, competencies and aspirations, then involve stakeholders to understand their assumptions and preferences, and scan the environment continuously. From this they can develop scenarios for analysis to formulate options and use pareto analysis to define a small number of actions with strong impact.

Climate Cataclysm: The Foreign Policy and National Security Implications, **Ed K. M. Campbell**, Brookings, 08. A two year study by a group of experts developed three plausible scenarios to 2040 and 2100. Expected Climate Change:- including reduced water availability; extreme weather; upward pressure on oil prices; higher risk of nuclear accident; need for greater provision of disaster relief, refugees flows and food aid. Severe Climate Change:- unexpected rise in temperatures; higher sea level rise; crops strongly affected; river system collapse in W. US and Mexico; failure of democracies in Latin America; and water scarcity leading to political collapse in N. African states. Catastrophic Climate Change through to 2100:- temperatures rise 5.6C and 6ft.6 rise in sea level; many coastal regions uninhabitable; acute shortage of food; .shorter life spans; anarchy in many regions with many refugees armed; collapse of globalisation and transactional institutions; and S. Asia implodes.

SCI/TECH/BIO/TECH/SPACE

Out in the Universe

Living Cosmos: Our Search for Life in the Universe, **C. Impey**, Random House, 07. In this thoughtful, and accessible survey, an astronomer first raises question about the potential for extra extra-terrestrial life for art and science. He covers modern science's development and its examination of terrestrial life, especially in extreme environments, then moves out into space to cover intelligent life, interstellar travel, current and future space missions and extra solar-planet research.

Humanity 3000. Humans and Space: The Next Thousand Years, Foundation for the Future, 06, www.futurefoundation.org. One of a series of workshops where experts consider very, very, long term futures. This 2005 event with nineteen participants reflected on three main issues to be addressed if humanity in space is to be realised and the critical factors which will lead to such an expansion. Many possibilities and reflections resulted.

While Mars is getting large funding missions, Venus, our relatively close neighbour, has been forgotten. Deep atmosphere exploration and surface exploration is being promoted, to follow on from the European 2005 launch of Venus Express, *Nature* 6 Sept, 07, pp.607-608. Human exploration of Venus is almost impossible but there are plenty of questions which closer mechanical exploration, for instance using huge balloons to float in the Venusian atmosphere, could help to answer. Surface rovers are probably too expensive since they would require a continuous power source, probably nuclear. Russia and Japan have indicated interest to follow on from the European initiative.

C. Dingwell et al, *Scientific American*, Oct 07, provide the details of the latest initiative by NASA and US companies to develop a space transport system, Constellation, which by 2020 will convey humans to and from the moon. They are starting with the Orion, which has much the same functionality as the former Apollo spacecraft, with far more advanced overall design and technology, and can accommodate a larger crew. This is planned to be underway by 2015.

Scientific American, Oct 07, has summaries of the overall strategies for future Space Exploration, both human and robotic, which by 2057 could offer insights into the following challenges:- monitoring Earth's climate by replacing the present aging satellites; preparing for asteroid defence by searching for 100-1000-metre bodies in near-Earth space; seeking out new life, with Mars, Jupiter, Titan, and Europa as targets; explaining the genesis of the planets to follow up from the fabulous collection obtained from the recent Stardust mission; and breaking out of the Solar system, using a dedicated probe to follow Voyager.

<http://www.cnn.com/2008/WORLD/europe/10/02/space.elevator/> reports that a former science fiction concept is taking steps towards becoming reality in the 21st century, as international scientists gather to confer on further development of a space elevator, a cable which could transport objects and people into orbit directly from the earth. The technology facilitating this is the rapidly developing application of carbon nanotubes with tensile strength 180 times stronger than steel. These can provide a tether and about a quarter of the required strength for the cable. Still to be resolved are how to build the base, how to design the elevator and where, since the base will need to be on geosynchronous orbit. The elevator is envisaged to become a supply system to a space station. It could enable space exploration to lift off beyond Earth's deep gravity well, and for humans to become a space-bearing species.

Adventures in Physics And Robotics

Scientific American, Feb 08, reports, **C.P Collins, C. Quigg, and B. Barish**, on the prospects opened up as the Large Hadron Collider (CERN) enables energy scales to move up to the terascale, smashing elementary particles together with a combined

energy of approximately a trillion volts. Particle physicists have been exploring the near limits for half a century but the terascale is new territory for exploring the nature of matter, the Standard Model of particle physics and its symmetry, the energy in the universe and more possibly bizarre discoveries such as new dimensions of matter. Already a new machine is on the drawing boards to succeed and complement CERN a decade hence.

A controversial existing research facility, High Frequency Active Aural Program (HAARP) in Alaska, is a super-powerful ionospheric heater designed to inject radio waves into the atmosphere, accelerating the electrons there which in turn affect the ionosphere. This will enable studies of the fundamental physics behind the interactions between plasma and electromagnetic waves. Already an artificial aurora has been created. The facility was developed to provide extremely low frequency (ELF) waves to communicate with underwater submarines during the Cold War. *Nature*, 24 April 08, pp.930-932.

Robotic Futures, Special Section, *Science* 16 November, 07, offers a range of perspectives on developments in robotics. While engineers have not yet found ways to create self-replicating robots, some robots have acquired sufficient autonomy to explore hostile environments with minimal human supervision, such as in deep space and deep oceans. Improvements in robotic performance are resulting from application of biological models found in living body plans and substructures. Artificial muscles are being developed which could eventually allow robots to run, jump and climb untethered. Some robots have brain-like devices to carry out tasks in the presence of visual cues and other sensory feedback, part of our developing understanding of human thinking and learning. *Science Editorial*, p.1083, same issue, raises questions about the need to develop Robot Ethical codes, to apply in the human-robot relationship. Japan, S. Korea and EU are already devising such systems.

Human Minds

Mirrors in the Brain, G.Rizzolatti, C. Sinigaglia, Tr. F. Anderson, O.U.P, 07. This readable survey covers the discovery of mirror neurons a decade ago, its progress through stages of scepticism and acceptance and its significance. Mirror neurons fire in the brain as a human or animal watches or imagines another action or impending action, and they also orchestrate when the hand and fingers move to perform an action. Consequently they are significant in our understanding of cognition. Whether this is an evolved ability, or one acquired by associative learning, is yet to be decided.

Towards Brain-Computer Interfacing, Ed. G. Dornhege, MIT Press, 07, provides contributions from a range of research groups, some using electrodes and some not. The research goals are:- to provide new communication channels for patients with severe neuromuscular disabilities; to provide a powerful tool for computational neuroscience; to advance understanding of the brain; and to provide a generic, novel, independent communication method for man-machine interaction.

Scientific American, March 08, **R. D. Fields** reports on the advances in understanding the role of white matter in the brain, which lies beneath the layers of grey matter (neurons). Long considered passive tissue, the myelin-coated axons of white matter have been revealed by a new magnetic resonance technology to be active. They

control the signals that the neurons share. The myelin is partially formed at birth and gradually develops as the brain reaches adulthood. The timing affects learning, self-control and some mental illnesses.

Contemplative Science: Where Buddhism and Neuroscience Converge, B. A. Wallace, Columbia Univ. Press, 07, argues that 'there is nothing fundamentally incompatible between contemplation and science'. This contemplative science seeks to reintegrate the human pursuit of genuine happiness, truth and virtue in an empirical way without adherence to any belief system. A variety of western and eastern perspectives are explored around the theme of first-person observations of mental phenomena and their relation to the world at large.

The Economist, March 22, 08, pp.83-85, reports on a new three-year project "**Explaining Religion**", the largest ever scientific study involving researchers from fourteen universities and a range of disciplines. The project will look at mental mechanisms that are needed to represent an omniscient deity and belief in such an entity. Neurochemical research can be tied to scanning studies looking for those parts of the brain which may be involved, some to focus on the limbic system while others consider how religious activity may be spread across many parts of the brain. Anthropological studies focus on the long term benefits, and the positive or negative effects of religious constraints, such as uses of food. Economists are using their games to explore religious influences in economic behaviour.