

MICHAEL WEST

A BINARY WORLD: CHINA, THE UNITED STATES, AND DIGITAL OCEANS

Forecasting is big business these days, and predictions on the future of international relations are highly sought after. As companies and governments seek to manage and exploit the transition to a Pacific-centred world, the simmering battle for primacy between the United States and China, in particular, has captured much attention. The contrast in their situations is replete with dramatic tension: a superpower in decline, heaving under the weight of corporate greed and unpopular foreign adventures, and a challenger rapidly gaining the confidence to stare down its richer, older rivals. Accurate projections of how the world will be reshaped are especially important to Australia, held in the cultural orbit of the United States, but geographically planted in Asia and with strong links to our region through immigration and trade. However, if we are to obtain reasonably useful estimates of the decades ahead, it is vital that we don't rely on outdated frameworks while ignoring the importance of disruptive forces, especially technology. This essay argues that several advances that promise to revolutionise commerce and manufacturing will also force a change to the present strategic balance anchored in American military power. This is not to say that China will overtake the United States, but that we must look more deeply into our collective crystal ball to ensure our vision of the future is an accurate one.

One thinker whose approach is typical of those that may become increasingly inaccurate is George Friedman, author of "The Next 100 Years: A Forecast for the 21st Century"¹. Friedman's central thesis is that North America's position, straddling the Pacific and Atlantic, makes it the perfect base for control of the world's oceans, and that the US Navy's global domination is "not only the foundation of America's security, but the foundation of its ability to shape the international system". With a combined tonnage of ships exceeding the next 13 navies combined², this arm of the United States reaches a long way indeed. A comparison of responses to Somali piracy in 2009 illustrates Friedman's observations. There is a vivid contrast between the rescue of an American crew by US Navy commandos, half a world away from their home shores, and the payment of a \$4 million ransom from Beijing to have a similar Chinese crew returned³. There is no doubt that the navy is a powerful tool of both protection and projection, keeping the United States safe from invasion and extending their muscle right to the shores of many unfriendly states. It has been part of their ethos for the whole of their short history; George Washington wrote in 1781 that "without a decisive naval force we can do nothing definitive, and with it, everything honorable and glorious"⁴.

But it is overly simplistic to define a country's power solely in terms of its susceptibility to armed occupations at home or its ability to engage in them overseas. Influence waxes and wanes for many reasons, without battles ever occurring. The international nature of the modern environment (globalisation,

communications) and the coming century's key challenges (climate change, development) provides even more reason to believe this. In an era when the non-military, domestic activities of one nation can profoundly affect another, power is not about conflict, it is about cooperation. Nations can damage others not only by waging war but also by refusing to join cooperative action on international problems. Like the "too big to fail" banking behemoths that spawned the global financial crisis, powerful countries can disregard unwelcome impositions and know that they will only be met with rhetoric instead of strong repercussions – it seems very unlikely that any country would invade another to impose a carbon tax. This is the first flaw in a solely geopolitical, military-focused method of projecting future outcomes.

Friedman's analysis also relies heavily on predictable patterns from history, with less consideration of expected technological revolutions that may render those patterns obsolete. His equation of American naval dominance with cultural and economic hegemony is based in large part on the centrality of shipping in modern commerce. The bulk movement of goods, from oil to grain to electronics, is accomplished via the oceans, so whoever dominates the sea routes has a large measure of control over international trade. But if the predictions of eminent scientists are true, this is likely to change radically in a timeframe much shorter than the hundred years Friedman ambitiously covers. This is because technology will enable a fundamental shift in how goods are produced, radically decentralising manufacturing in the way that the Internet has decentralised the media, politics, and many other aspects of our lives. At least three technologies will lead this charge: robotics, genetic engineering, and virtual reality interfaces; there will undoubtedly be others not yet imagined. The net effect of these will be to enable everyone to produce goods cheaply at home or nearby, rather than only in distant factories.

The promise of robotics laid out in the pop culture of the mid-20th century remains largely unrealised, but enormous leaps have been made. Importantly, the sorts of systems required for domestic manufacturing are eminently within our grasp. Rapid-prototyping devices, which build custom shapes by fusing resin or powder⁵, and self-reconfiguring modular robots, which intelligently rearrange themselves⁶, will be highly disruptive influences on international trade. In the coming decades, they will give any household the ability to produce, at home, any product that can be modelled on a computer. Instead of buying products, people will buy software blueprints designed by experts, and manufacture the item themselves. When American consumer goods are made in American homes instead of Chinese factories, a radically different economic paradigm will emerge.

Similar advances will be supplied by genetic engineering, where humanity will attain significant mastery of natural processes if ethical questions do not halt development. Artificial intelligence pioneer Rodney Brooks has stated that the thirty-year goal of his prestigious research centre at the Massachusetts Institute of Technology is that instead of growing trees, chopping them down, machining the wood and assembling planks into a table, a consumer will simply be able to grow the table from scratch without any intervention⁷. This level of elegant precision would similarly rely on the provision of plans by experts – in this case, DNA. Scientist Freeman Dyson has argued that so-called "domesticated biotech", the emergence

- 1 G. Friedman, *The Next 100 Years: A Forecast for the 21st Century*, Doubleday, New York, 2009.
- 2 R. Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age", Jan/Feb 2009, *Foreign Affairs*, <<http://www.foreignaffairs.com/articles/63717/robert-m-gates/a-balanced-strategy>>, consulted 11 January 2010.
- 3 For the American rescue, see: R. McFadden and S. Shane, "In Rescue of Captain, Navy Kills 3 Pirates", 12 April 2009, *The New York Times*, <<http://www.nytimes.com/2009/04/13/world/africa/13pirates.html>>, consulted 11 January 2010.
For the Chinese ransom payment, see: A. Guled, "Somali pirates say \$4 million ransom paid for coal ship", 27 December 2009, *Reuters*, <<http://www.reuters.com/article/idUSTRE5BQ0K420091227>>, consulted 11 January 2010.
- 4 G. Washington, "Letter to Marquis de Lafayette", 1781. Quoted by "Traditions of the Naval Service", *Naval Historical Center of the United States Navy*, 8 January 2008, <<http://www.history.navy.mil/trivia/trivia02.htm>>, consulted 11 January 2010.
- 5 A. Bowyer, "RepRap – the Replicating Rapid-Prototyper", 2007, *RepRap Project*, <<http://reprap.org/pub/Main/WebHome/one-page.pdf>>, consulted 12 January 2010.
- 6 M. Yim et al. (2007), "Modular Self-Reconfigurable Robot Systems", *IEEE Robotics and Automation Magazine*, vol. 14, no. 1, pp.43-52.
- 7 R. Brooks, "The Future of Matter", in J. Brockman (ed.), *The Next Fifty Years*, Vintage Books, New York, 2002, p. 187.



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of hobbyists splicing genes to create new life-forms, would be a natural step from today's flower breeders who do this in a more primitive fashion⁸. Biotechnology companies will sell the genomes for both living things and household goods, for consumers to grow at home. If this seems unrealistic, recall that in the mid-20th century, computer programming was an esoteric and highly specialised subject used only in research, whereas now there are many hobby programmers and software companies sell products to huge audiences.

The revolutionary effect of these new technologies will be to drastically shift trade away from tangible items in boxes, and towards software patterns to make those items at home. The oceans are going digital, replaced by floods of information coursing between continents through the internet. In such an era, control of sea lanes by naval dominance will become less important. Instead, guaranteeing the security of digital companies against hacking, piracy and even deliberate government-sponsored cyberwar will become vital. This will be a difficult task: attacks can be sudden, unpredictable, and made quietly without the backing of a huge military-industrial complex. Nations are already alleged to have dabbled in electronic attacks, such as Russia's interference with Georgia or China's vehement denial that it probed American intelligence agencies⁹. American search giant Google recently halted its voluntary self-censorship in China after detecting attempts to compromise the email accounts of Chinese human rights activists using its products¹⁰. Governments have plenty to gain, as plausible deniability is high, and targeted populations may lack the conceptual apparatus to be outraged by nebulous, invisible cyberwar, as opposed to the visceral emotion of bombing or other assaults.

Of course, there will still be traditional sea-based trade. Raw materials must be transported, especially those crucial for this century's big technologies: lithium for batteries, silicon for solar panels, trace elements for electronics, and so on. These are not always located in politically stable regions: most of the world's lithium is located in a desert spanning Chile and Bolivia¹¹, and coltan (used in mobile phones) is already one of the "resource curse" minerals for which warring factions have torn apart the Democratic Republic of the Congo. Real-world militaries will not disappear, therefore, but they must be strongly supplemented by new virtual ones. Brawn based in weapons counts for nothing on the internet. Friedman's thesis, that the US Navy will continue to guarantee America's status as the lone superpower, is flawed for this reason.

Does this, then, spell an inevitable decline for the US? Prosperity and security will be dependent on advanced knowledge, so it is a question of how much investment is made in technology and research. The enabling technologies, such as robotics and genetics, must still be developed further, and continued innovations in software and encryption will be needed to ensure safe digital commerce in an era that will greatly surpass the scale of today's Amazon and eBay. The United States is in a far better position than China to build, exploit and safeguard these, because of its commanding lead in science and higher education. Scanning a list of the world's 100 best universities, the American flag appears 55 times. China's performance is markedly less stellar, entirely absent from the list, as James Fallows has pointed out¹². The domination extends to the elite level too, with 17 of the top 20 universities in the USA, and the remaining three in Japan and the UK, both strong American allies. Rankings are notoriously fickle but this is no biased American exercise in self-congratulation, it is the widely-cited annual study published by Shanghai Jiao Tong University¹³. Some recent reports¹⁴ have spoken breathlessly of China's rapidly rising scientific output, but conflating quantity with quality is a mistake. All of the nine ethnic Chinese Nobel Laureates were citizens of other countries, usually the United States, when they did the work for which the prize was awarded¹⁵. China faces an immense brain drain which is difficult to halt. Factors like higher living standards, less restricted speech,

and a greater supply of dynamic venture capital providers, together with China's rigidly seniority-focused academic system, contribute to making migration to the West an attractive option for young, talented scientists¹⁶. As American biologist Harold Varmus has noted, 25 percent of members of the National Academy of Sciences are foreign-born¹⁷; this number is not likely to decrease in coming decades, and we can expect the American economy and "virtual military" to maintain global primacy as a result.

As Yogi Berra aptly put it, "[i]t's tough to make predictions, especially about the future." The message for purveyors of hypotheses about the relative strength of China and the United States is that they must not assume a static environment based on the past. The rules of the game will change, and those who are better placed to adapt to the new situation will flourish. This, far more than geopolitical restrictions of terrain or expressions of military might, will determine how nations can exert power and how they are perceived by others. Americans worry about decline and decay as a national pastime, strangely at odds with their exceptionalist philosophy, but they probably have little to fear. The United States remains a global magnet for talent, especially in science, and it is this rather than the strength of their navy that will help them maintain superpower status during the technological upheavals of the coming decades. But one thing that is certain is that these will be, to paraphrase the proverbial Chinese curse, "interesting times".

8 See especially F. Dyson, in remarks at "Life: What a Concept!" conference (2007). Transcript available online at *Edge Foundation*, <http://edge.org/documents/life/dyson_index.html>, consulted 13 January 2010.

9 For the Russia-Georgia controversy, see: J. Richards, "Georgia accuses Russia of waging 'cyber-war'", 11 August 2008, *The Times Online*, <http://technology.timesonline.co.uk/tol/news/tech_and_web/article4508546.ece>, consulted 12 January 2010.

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10 D. Drummond, "A New Approach to China", 12 January 2010, *The Official Google Blog*, <<http://googleblog.blogspot.com/2010/01/new-approach-to-china.html>>, consulted 12 January 2010.

11 D. Rothkopf, "Is a Green World Safer? Not Necessarily", Sept/Oct 2009, *Foreign Policy*, <http://www.foreignpolicy.com/articles/2009/08/17/is_a_green_world_a_safer_world_not_necessarily>, consulted 8 January 2010.

12 J. Fallows, "How America Can Rise Again", in *The Atlantic*, Jan/Feb 2010, *The Atlantic*, <<http://www.theatlantic.com/doc/print/201001/american-decline>>, consulted 11 January 2010.

13 "Academic Ranking of World Universities 2009", *Shanghai Jiao Tong University*, 2009, <<http://www.arwu.org/ARWU2009.jsp>>, consulted 11 January 2010.

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15 W. Ma, "Why No Mainland Chinese Nobel Laureates", 26 October 2009, *China Stakes*, <<http://www.chinastakes.com/2008/10/Why-No-Mainland-Chinese-Nobel-Laureates.html>>, consulted 11 January 2010.

16 Fallows.

17 Quoted in Fallows.