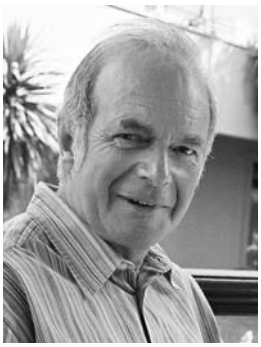
CHALLENGED BY CARBON: THE OIL INDUSTRY, CLIMATE CHANGE - AND DEEPWATER HORIZON



Dr Bryan Lovell

You can't argue with a rock. Thanks to geology, the scientific case for human-induced climate change has recently become significantly more plausible. New observational science based on cores taken deep beneath the floor of the Atlantic Ocean offers crucial support for the computer-based forecasts of those creating models of future climate change. Thanks to the work of the late Sir Nick Shackleton and his colleagues, the record of Earth's past climates recorded in rocks can now be measured with far greater definition than before: divided into thousands rather than millions of years. This major scientific breakthrough means that changes in climate that took place long ago can now be examined on a human timescale.

One of these ancient past changes in climate is a particularly important guide to present-day concerns: a dramatic warming event that took place 55 million years ago (55 Ma). Comparison of the volume of carbon released to the atmosphere at 55 Ma and the volume we are now releasing ourselves strongly suggests that we are indeed facing a major global challenge (see Figure). We are well on our way to repeating that 55 million-year-old global warming event, which disrupted Earth for over 100,000 years. That event took place long before *Homo sapiens* was around to light so much as a camp fire. Now we have no excuses, we are here and we are aware of our capacity to precipitate major inimical changes to our habitat on this planet. We can cope, but only by adopting a new intellectual framework for energy policy that is based on that awareness.

This is an unusual challenge to the established order, comparable to the greatest periods of political and social change. Successful resolution will require an unusual degree of cooperation between all sorts of tribes: academic, social, financial, industrial, political and national. This kind of cooperation was the real value of the 1997 Kyoto Protocol, and was the original hope for the disappointing successor meeting in Copenhagen in 2009. That hope has now been transferred to the imminent Cancun climate summit. The Kyoto agreement was never going to be a sufficient answer in itself to coping with climate change, but it was a sign that the global community has the capacity to edge towards the scale of cooperation that is required.

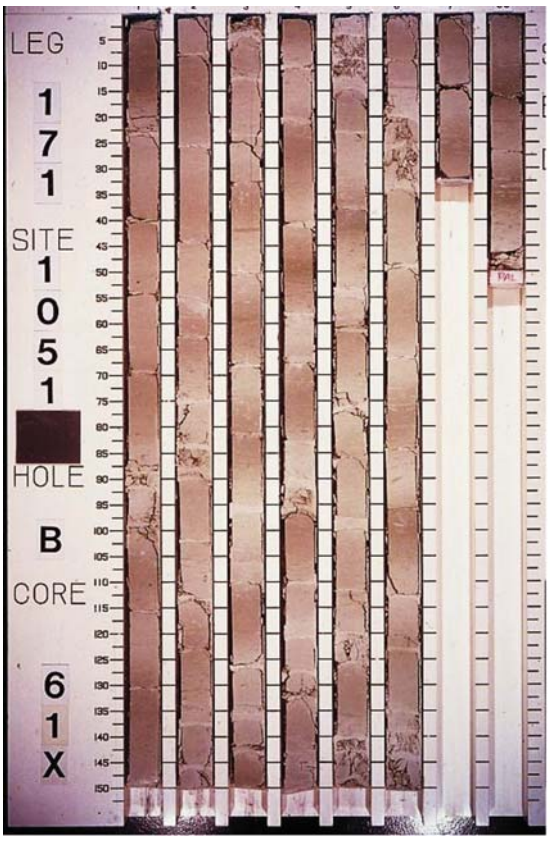
That cooperation clearly has to embrace China and India. These two countries are moving along paths of development that emulate those followed previously in the developed world, with heavy reliance on fossil fuels – especially coal. How can such countries achieve their aspirations for rapid development while maintaining their current relatively low per-capita output of fossil carbon? Can the developed countries maintain the confidence of their consumers and voters while reducing per-capita output of fossil carbon?

Here the oil companies may have a chance of redemption from their classical role as the villains of climate change, by giving a positive response to being challenged by carbon. In

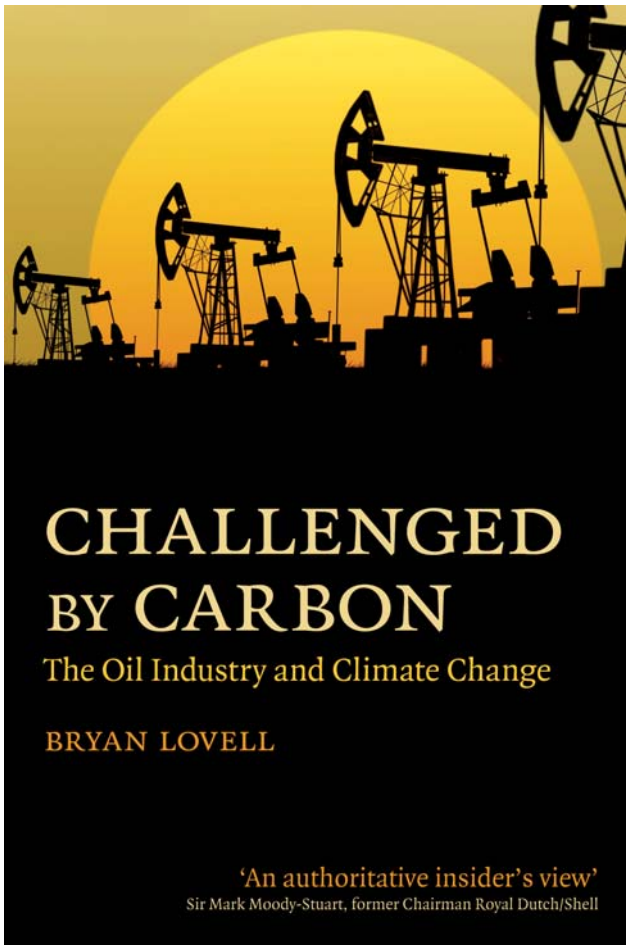
principle they could capture and then store safely underground a good part of the fossil carbon released to the atmosphere through their agency – and that of the coal industry. Although the price in energy and dollars of that capture and safe storage is still not clearly defined, I for one would put effort into such a venture – given the creation of a fungible market for carbon comparable to that we now have for oil.

Can the major international non-state oil companies, who control only a few per cent of the world's reserves of oil and gas, persuade their shareholders to keep investing when they seek to make money by disposing of fossil carbon (in the form of anthropogenic carbon dioxide), as well as profit by pumping it out of the ground (in the form of oil and natural gas)? And can the major state oil companies, who control the greater part of the world's reserves of oil and gas, persuade their governments that part of their role should be the safe disposal of carbon dioxide?

Yes, but only if political, economic and financial institutions adapt to a global imperative to regard the safe capture and disposal of carbon dioxide as an activity as important as taking fossil fuels out of the ground. This adaptation clearly requires a widespread and deep conviction that there really is a problem to be solved. That depth of conviction can be achieved by reading what is written in the rocks.



Cores of 55 million-year-old sedimentary rock recovered in 1997 from beneath the deep sea floor of the North Atlantic Ocean by Ocean Drilling Programme.



The oil industry is based on rocks found across the planet. Will that industry be able to seize the advantage of its geological and global perspective to bring general environmental benefit to its customers, while protecting its own profits? We have long relied on the oil folk to use their ingenuity to supply us with their mighty handy products: now we need their inventiveness to help us manage our transition from that dependency. But can we trust the oil companies to help us with that transition, in the wake of the Deepwater Horizon blowout in the Gulf of Mexico in April 2010? The short answer is still yes, but to see why we need to look at that tragic accident from a number of angles.

My first and main comment on Deepwater Horizon is this: you don't have to have been involved in oil exploration to recognise that loss of life on a drilling rig dwarfs all other considerations. After that come reckonings of environmental impact, costs and corporate and personal responsibilities – and assessment of technical competence.

An extraterrestrial visitor to the scene of the spill in the Gulf of Mexico, versed in geology but not in history, might ask: why does humankind seek high-cost oil and gas here rather than drilling much more cheaply onshore in Iran? As a veteran of early deepwater Atlantic drilling in the 1980s, and former Middle East exploration manager for BP, I'm happy to have a go at that question.

Only part of Earth was formerly covered by the ancient

Tethys Oceans, the geological evolution of which led over tens of millions of years to the generation and preservation of abundant oil in what is now the Middle East. By the 1980s access to much of that oil could be gained only on post-imperial service-fee terms, which had limited attraction for the many oil companies used to high risk-high reward equity-based deals. Hence the move into deepwater Atlantic exploration, hence the subsequent big successes in finding oil for our continuing eager use off the shores of Angola, Brazil — and in the Gulf of Mexico.

The human spill from Deepwater Horizon will wash across the Gulf to the next prospectively querulous climate summit that is about to begin in Cancun. During the weeks that oil leaked into the gulf from the Macondo well, at rates an order of magnitude greater than natural regional seepage, around the world we continued to add to the hundreds of billions of tonnes of carbon that we have already released into the atmosphere (see Figure). We have dumped this carbon deliberately, not accidentally, as we burn fossil carbon taken from beneath the gulf and elsewhere: coal, gas and oil.

The fossil carbon spilt in the form of oil from Deepwater Horizon has been obvious to those nearby, and to the world at large. The invisible and odourless carbon dioxide added to the atmosphere by mankind burning fossil carbon is not at all obvious. In the atmosphere it is measured in mere traces: if it smelt, it would catch the attention of a springer spaniel but might still not alert a human being. Yet the effects are significant: the dog barks urgently and we need to act now.

It was an early cliché of the climate debate that we are carrying out an experiment with the planet with an unknown outcome: that is no longer true. We can now see quite clearly what happens when you dump carbon into the atmosphere at the rate and volume of the past couple of centuries. There is significant global warming. The temperature of the deep ocean waters rises by several degrees centigrade, leading to a rise in sea-level of several metres. Acidification of the oceans contributes to widespread extinction of marine life, accompanied by widespread extinction of life on land. This natural experiment has been repeated several times on planet Earth. Unless we are curious to see if our own species can survive, we should stop pulling the carbon trigger.

Once most of us are convinced by the message from the past that we really do have a problem in the future we will find an unlikely potential ally. The oil industry can pump carbon dioxide released by coal-fired power stations into safe underground storage using routine technology, without depending on the frontier technology used in deepwater operations in the Gulf of Mexico and elsewhere. This underground storage will be opposed by some on the grounds that it prolongs the life of the villainous fossil-fuel industries. Yet it is inevitable that coal will continue to supply much of the world's demand for electricity for years. The oil industry should prepare to act on the heroic scale required to make a dent in the problem of carbon release.

Deepwater Horizon reminds us that terrible accidents may take the lives of the skilled workers who probe rocks to find the fossil carbon that has fuelled so much of our material prosperity over the past century. What is written in those same rocks tells us, with increasing urgency, that we cannot simply burn that carbon with impunity.

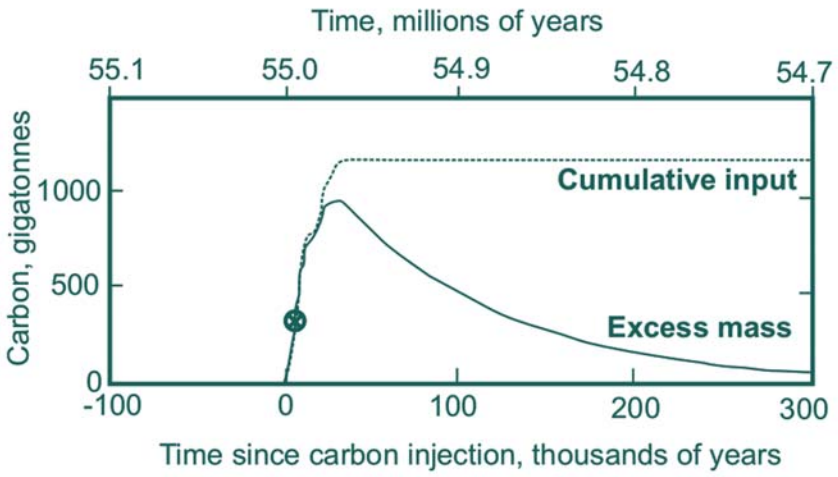


Figure (figure 2.3 in Challenged by Carbon, CUP 2009)
Sketch after a section of an illustration used by Professor Gerald Dickens in his discussion of the work of Richard Norris and Ursula Rohl in *Nature* in 1999. This figure shows the rapid release 55 million years ago of carbon and its subsequent removal (see 'Excess mass') from the atmosphere and oceans over 100 000 years. We may use this 55 Ma event as a guide to the effect of our present-day release of carbon, should this remain unchecked. We have so far climbed at least 300 gigatonnes (a gigatonne is a thousand million tonnes) up the steep slope of 'Excess mass' that begins at zero (55 Ma), so we have already reached at least as far up the curve as the point marked X.

Bryan Lovell has been Senior Research Fellow in Earth Sciences at Cambridge University since 1996. He was formerly with BP Exploration, and at Oxford, Harvard, and Edinburgh Universities. Lovell is currently President of the Geological Society, writing here as an individual. This article is drawn from his *Challenged by Carbon: the Oil Industry and Climate Change*, published by Cambridge University Press in 2009, and from his article on Deepwater Horizon in *The Times* of 4 August, 2010.