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Carbon democracy

Timothy Mitchell

Abstract

States that depend upon oil revenues appear to be less democratic than other states. Yet oil presents a much larger problem for democracy: faced with the threats of oil depletion and catastrophic climate change, the democratic machineries that emerged to govern the age of carbon energy seem to be unable to address the processes that may end it. This article explores these multiple dimensions of carbon democracy, by examining the intersecting histories of coal, oil and democracy in the twentieth century. Following closely the methods by which fossil fuels were produced, distributed and converted into other forms of socio-technical organization, financial circulation and political power, the article traces ways in which the concentration and control of energy flows could open up democratic possibilities or close them down; how connections were engineered in the post-war period between the flow of oil and the flows of international finance, on which democratic stability was thought to depend; how these same circulations made possible the emergence of the economy and its unlimited growth as the main object of democratic politics; and how the relations among forms of energy, finance, economic knowledge, democracy and violence were transformed in the 1967–74 oil–dollar Middle East crises.

Keywords: democracy; oil; coal; Middle East.

Fossil fuels helped create both the possibility of twentieth-century democracy and its limits. To understand the limits, I propose to explore what made the emergence of a certain kind of democratic politics possible, the kind I will call carbon democracy. Before turning to the past, however, let me mention some of the contemporary limits I have in mind.

In the wake of the US invasion of Iraq in 2003, one of those limits was widely discussed. A distinctive feature of the Middle East, many said, is the region's lack of democracy. In several of the scholarly accounts, the lack has

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something to do with oil. Countries that depend upon petroleum resources for a large part of their earnings from exports tend to be less democratic.[1] However, most of those who write about the question of the 'rentier state' or the 'oil curse', as the problem is known, have little to say about the nature of oil and how it is produced, distributed and used.[2] They merely discuss the oil rents, the income that accrues after the petroleum is converted into government revenue.[3] So the reasons proposed for the anti-democratic properties of oil – that it gives government the resources to relieve social pressures, buy political support or repress dissent – have little to do with the ways oil is extracted, processed, shipped and consumed, the forms of agency and control these processes involve or the powers of oil as a concentrated source of energy.

Ignoring the properties of oil itself reflects an underlying conception of democracy. This is the conception shared by the American democracy expert who addressed a local council in southern Iraq: 'Welcome to your new democracy,' he said. 'I have met you before. I have met you in Cambodia. I have met you in Russia. I have met you in Nigeria.' At which point, we are told, two members of the council walked out (Stewart, 2006, p. 280). It is to see democracy as fundamentally the same everywhere, defined by universal principles that are to be reproduced in every successful instance of democratization, as though democracy occurs only as a carbon copy of itself. If it fails, as it seems to in oil states, the reason must be that some universal element is missing or malfunctioning.

Failing to follow the oil itself, accounts of the oil curse diagnose it as a malady located within only one set of nodes of the networks through which oil flows and is converted into energy, profits and political power – in the decision-making organs of individual producer states. Its aetiology involves isolating the symptoms found in producer states that are not found in non-oil states. But what if democracies have not been carbon copies, but carbon-based? Are they tied in specific ways to the history of carbon fuels? Can we follow the carbon itself, the oil, so as to connect the problem afflicting oil-producing states to other limits of carbon democracy?

The leading industrialized countries are also oil states. Without the energy they derive from oil their current forms of political and economic life would not exist. Their citizens have developed ways of eating, travelling, housing themselves and consuming other goods and services that require very large amounts of energy from oil and other fossil fuels. These ways of life are not sustainable, and they now face the twin crises that will end them: although calculating reserves of fossil fuels is a political process involving rival calculative techniques, there is substantial evidence that those reserves are running out;[4] and in the process of using them up we have taken carbon that was previously stored underground and placed it in the atmosphere, where it is causing increases in global temperatures that may lead to catastrophic climate change (IPCC, 2007).[5] A larger limit that oil represents for democracy is that the

political machinery that emerged to govern the age of fossil fuels may be incapable of addressing the events that will end it.

To follow the carbon does not mean substituting a materialist account for the idealist schemes of the democracy experts, or tracing political outcomes back to the forms of energy that determine them – as though the powers of carbon were transmitted unchanged from the oil well or coalface to the hands of those who control the state. The carbon itself must be transformed, beginning with the work done by those who bring it out of the ground. The transformations involve establishing connections and building alliances – connections and alliances that do not respect any divide between material and ideal, economic and political, natural and social, human and non-human or violence and representation. The connections make it possible to translate one set of resources and powers into another. Understanding the relations between fossil fuels and democracy requires tracing how these connections are built, the vulnerabilities and opportunities they create and the narrow points of passage where control is particularly effective.[6] Political possibilities were opened up or narrowed down by different ways of organizing the flow and concentration of energy, and these possibilities were enhanced or limited by arrangements of people, finance, expertise and violence that were assembled in relationship to the distribution and control of energy.

Buried sunshine

Like mass democracy, fossil fuels are a relatively recent phenomenon. The histories of the two kinds of forces have been connected in several ways. This article traces four sets of connections, the first two concerned with coal and the rise of mass politics in the late nineteenth and early twentieth centuries, the second two with oil and organizing limits to democratic politics in the mid-twentieth century.

The first connection is that fossil fuel allowed the reorganization of energy systems that made possible, in conjunction with other changes, the novel forms of collective life out of which late-nineteenth-century mass politics developed.

Until 200 years ago, the energy needed to sustain human existence came almost entirely from renewable sources, which obtain their force from the sun. Solar energy was converted into grain and other crops to provide fuel for humans, into grasslands to raise animals for labour and further human fuel, into woodlands to provide firewood and into wind and water power to drive transportation and machinery (Sieferle, 2001).

For most of the world, the capture of solar radiation in replenishable forms continued to be the main source of energy until perhaps the mid-twentieth century.[7] From around 1800, however, these renewable sources were steadily replaced with highly concentrated stores of buried solar energy, the deposits of carbon laid down 150 to 350 million years ago when the decay of peat-bog forests and of marine organisms in particular oxygen-deficient environments

converted biomass into the relatively rare but extraordinarily potent deposits of coal and oil.[8]

The earth's stock of this 'capital bequeathed to mankind by other living beings', as Sartre (1977, p. 154) once described it, will be exhausted in a remarkably short period – most of it, by some calculations, in the 100 years between 1950 and 2050 (Aleklett & Campbell, 2003; Deffeyes, 2005).[9] To give an idea of the concentration of energy we will be exhausting, compared to the plant-based and other forms of captured solar energy that preceded the hydrocarbon age: a single litre of petrol used today needed about twenty-five metric tons of ancient marine life as precursor material, and organic matter the equivalent of the earth's entire production of plant and animal life for 400 years was required to produce the fossil fuels we burn in a single year (1997 figures from Dukes, 2003; Haberl, 2006).

Compared to these concentrated hydrocarbon stores, solar radiation is a weak form of energy. However, it is very widely distributed. Historically its use encouraged relatively dispersed forms of human settlement – along rivers, close to pastureland and within reach of large reserves of land set aside as woods to provide fuel. The switch to coal over the last two centuries enabled the concentration of populations in cities, in part because it freed urban populations from the need for adjacent pastures and woods. In Great Britain, the substitution of wood by coal created a quantity of energy that would have required forests many times the size of existing wooded areas if energy had still depended on solar radiation. By the 1820s, coal 'freed', as it were, an area of land equivalent to the total surface area of the country. By the 1840s, coal was providing energy that to obtain from timber would have required forests covering twice the country's area, double that amount by the 1860s and double again by the 1890s (Sieferle, 2001; Pomeranz, 2000). Thanks to coal, Great Britain, the United States, Germany and other coal-producing regions could be catapulted into a new 'energetic metabolism', based on cities and large-scale manufacturing.[10]

We associate industrialization with the growth of cities, but it was equally an agrarian phenomenon – and a colonial one. Production on a mass scale required access to large new territories for growing crops, both to supply the food on which the growth of cities and manufacturing depended and to produce industrial raw materials, especially cotton. By freeing land previously reserved as woodland for the supply of fuel, fossil energy contributed to this agrarian transformation. As Pomeranz (2000) argues, the switch to coal in north-west Europe interacted with another land-releasing factor, the acquisition of colonial territories. Colonies in the New World provided the land to grow industrial crops. They also generated a direct and indirect demand for European manufacturing, by creating populations of enslaved Africans who were prevented from producing for their own needs. Europe now controlled surplus land that could be used to produce agricultural goods in quantities that, together with arrangements of the slave plantation, allowed the development of coal-based mass production, centred in cities.

This relationship between coal, colonization and industrialization points to the first set of connections between fossil fuels and democracy. Limited forms of representative government had developed in parts of Europe and its settler colonies in the eighteenth and nineteenth centuries. From the 1870s, however, the emergence of mass political movements and organized political parties shaped the period that Eric Hobsbawm calls both 'the age of democratization' and 'the age of empire'.[11] The mobilization of new political forces depended upon the concentration of population in cities and in manufacturing, enabled in part by the control of colonized territories and enslaved labour forces, but equally associated with the forms of mass collective life made possible by organizing the flow of unprecedented concentrations of non-renewable stores of carbon.

Controlling carbon channels

Fossil fuels are connected with the mass democracy of the late nineteenth and early twentieth centuries in a second way. Large stores of high-quality coal were discovered and developed in relatively few sites: central and northern England, South Wales, the Ruhr Valley, Upper Silesia and Appalachia.[12] Most of the world's industrial regions grew above or adjacent to supplies of coal (Pollard, 1981; Rodgers, 1998, p. 45). However, coal was so concentrated in carbon content that it became cost-effective to transport energy overland or on waterways in much greater quantities than timber or other renewable fuel supplies. In Britain, the first Canal Acts were passed to dig waterways for the movement of coal (Jevons, 1865, pp. 87–8). The development of steam transport, whose original function was to serve coal-mining and which in turn was fuelled by coal, facilitated this movement. Large urban and industrial populations could now accumulate at sites that were no longer adjacent to sources of energy. By the end of the nineteenth century, industrialized regions had built networks that moved concentrated carbon stores from the underground coal face to the surface, to railways, to ports, to cities and to sites of manufacturing and electrical power generation.

Great quantities of energy now flowed along very narrow channels. Large numbers of workers had to be concentrated at the main junctions of these channels. Their position and concentration gave them, at certain moments, a new kind of political power. The power derived not just from the organizations they formed, the ideas they began to share or the political alliances they built, but from the extraordinary concentrations of carbon energy whose flow they could now slow, disrupt or cut off.

Coal-miners played a leading role in contesting labour regimes and the powers of employers in the labour activism and political mobilization of the 1880s onwards. Between 1881 and 1905, coal-miners in the United States went on strike at a rate about three times the average for workers in all major industries, and double the rate of the next highest industry, tobacco manufacturing.

Coal-mining strikes also lasted much longer than strikes in other industries.[13] The same pattern existed in Europe. Podobnik (2006) has documented the wave of industrial action that swept across the world's coal-mining regions in the later nineteenth century and early twentieth century, and again after the First World War.[14]

The militancy of the miners can be attributed in part to the fact that moving carbon stores from the coal seam to the surface created unusually autonomous places and methods of work. The old argument that mining communities enjoyed a special isolation compared to other industrial workers, making their militancy 'a kind of colonial revolt against far-removed authority', misrepresents this autonomy (Kerr & Siegel, 1934, p. 192). More recent accounts stress the diversity of mining communities and the complexity of their political engagements with other groups, with mine-owners and with state authorities (Church, Outram & Smith, 1991; Fagge, 1996; Harrison, 1978). As Goodrich had argued, 'the miner's freedom' was a product not of the geographical isolation of coal mining regions from political authority but of 'the very geography of the working places inside a mine' (1925, p. 19). In the traditional room-and-pillar method of mining, a pair of miners worked a section of the coal seam, leaving pillars or walls of coal in place between their own chamber and adjacent chambers to support the roof. They usually made their own decisions about where to cut and how much rock to leave in place to prevent cave-ins (Podobnik, 2006, pp. 82–5). Before the widespread mechanization of mining, Goodrich wrote, 'the miner's freedom from supervision is at the opposite extreme from the carefully ordered and regimented work of the modern machine-feeder' (1925, p. 14).[15]

The militancy that formed in these workplaces was typically an effort to defend this autonomy against the threats of mechanization or against the pressure to accept more dangerous work practices, longer working hours or lower rates of pay. Strikes were effective, not because of mining's colonial isolation, but on the contrary because of the flows of carbon that connected chambers beneath the ground to every factory, office, home or means of transportation that depended on steam or electric power.

The power of the miner-led strikes appeared unprecedented. In Germany, a wave of coal-mining strikes in early 1889 and again in December of that year shocked the new Kaiser, Wilhelm II, into abandoning Bismarck's hard-line social policy and supporting a programme of labour reforms (Canning, 1996, pp. 130–3). The Kaiser convened an international conference in March 1890 that called for international standards to govern labour in coal-mining, together with limits on the employment of women and children. By a 'curious and significant coincidence', as the *New York Times* reported, on the same day the conference opened in Berlin, 'by far the biggest strike in the history of organized labour' was launched by the coal-miners of England and Wales. The number of men, women and children on strike reached 'the bewildering figure of 260,000'. With the great manufacturing enterprises of the north about to

run out of coal, the press reported, 'the possibilities of a gigantic and ruinous labor conflict open before us'.[16]

Large coal strikes could trigger wider mobilizations, as with the violent strike that followed the Courrières colliery disaster of 1906 in northern France, which helped provoke a general strike that paralysed Paris.[17] The commonest pattern, however, was for strikes to spread through the interconnected industries of coal-mining, railways, dock workers and shipping.[18] By the turn of the twentieth century, the vulnerability of these connections made the general strike a new kind of weapon.

A generation earlier, in 1873, Engels had rejected the idea of a general strike as a political instrument, likening it to ineffectual plans for the 'holy month', a nationwide suspension of work, that the Chartist movement had preached in the 1840s (Engels, 1939 [1873]). Workers lacked the resources and organization to carry out a general strike, he argued. Were they to acquire such resources and powers of organization, he said, they would already be powerful enough to overthrow the state, so the general strike would be an unnecessary detour.

Thirty years later, Rosa Luxemburg developed an alternative view. After witnessing the wave of strikes that paralysed Russia in the 1905 Revolution, she argued in *The mass strike* (1906) that workers could now organize a revolution without a unified political movement, because isolated economic struggles were connected into a single force. This force, she wrote, 'flows now like a broad billow over the whole kingdom, and now divides into a gigantic network of narrow streams' (1925 [1906], ch. 4).[19] Luxemburg's language tried to capture the dispersed yet interconnected power that workers had now acquired. However, her use of a fluvial metaphor missed the fact that it was railways and canals, more than streams and tides, and the coal and coal-based products they carried that assembled workers together into a new kind of political force.

During the First World War, US and British coalfields and railways were placed under the direction of government administrators, and coal and rail workers were in some cases excused conscription and integrated into the war effort. Strikes were reduced, but the critical role of these energy networks became more visible (Corbin, 1981; Reifer, 2004). After the war, from the West Virginia coal strikes of 1919 to the British General Strike of 1926, one can trace the development of the 'triple alliance', of mine workers, dockers and railwaymen, with the power to shut down energy nodes. The dispersed energy systems of solar radiation had never allowed groups of workers this kind of power.

The strikes were not always successful, but the new vulnerability experienced by the owners of mines, railways and docks, together with the steel mills and other large manufacturing enterprises dependent on coal, had its effects. In 1914, the massacre of striking coal-miners in Ludlow, Colorado, caused a political crisis that threatened the power of the Rockefeller family, which owned the mines (Chernow, 1998, pp. 571–90). Rockefeller hired Mackenzie King, a Harvard-trained political economist who had helped

resolve more than forty coal, railway, shipping and other strikes as Canadian minister of labour, to devise a new method of managing workers (King, 1918, p. 13). King's report on the crisis, *Industry and humanity: A study in the principles underlying industrial reconstruction* (1918), explained the new vulnerability:

> If the recent past has revealed the frightful consequences of industrial strife, do not present developments all over the world afford indications of possibilities infinitely worse? Syndicalism aims at the destruction by force of existing organization, and the transfer of industrial capital from present possessors to syndicates or revolutionary trades unions. This it seeks to accomplish by the 'general strike.' What might not happen, in America or in England, if upon a few days' or a few weeks' notice, the coal mines were suddenly to shut down, and the railways to stop running! ... Here is power which, once exercised, would paralyze the ... nation more effectively than any blockade in time of war.
>
> (King, 1918, pp. 494–5)

King's report provided a blueprint for the corporate management of labour. After working as an industrial relations consultant to Rockefeller and other firms, he returned to politics in Canada, where he served as prime minister for twenty-two years and became the architect of the country's welfare state.[20]

The difficult fight against the resources of a labour movement that, for the period of a few decades, could threaten a country's carbon energy networks helped impel the owners of large industrial firms and their political allies into accepting the forms of welfare democracy and universal suffrage that would weaken working-class mobilization.

From coal to oil

After the Second World War, the coal-miners of Europe again appeared as the core of a militant threat to corporatist democratic politics. As US planners worked to engineer the post-war political order in Europe, they came up with a new mechanism to defeat the coal-miners: to convert Europe's energy system from one based on coal to one based predominantly on oil. Western Europe had no oilfields, so the additional oil would come from the Middle East.[21] Scarce supplies of steel and construction equipment were shipped from the United States to the Persian Gulf, to build a pipeline from eastern Saudi Arabia to the Mediterranean, to enable a rapid increase in oil supplies to Europe. The diversion of steel and of Marshall Plan funds for this purpose was justified in part by the need to undermine the political power of Europe's coal-miners (Forrestal, 1941–9, p. 2005, 1951, Vol. 9–10, 6 January 1948; Painter, 1984, p. 361).[22]

Like coal, oil gave workers new kinds of power. Decisive industrial action was organized at Baku in 1905 in the Russian-controlled Caucasus, in the Maracaibo strikes of 1922 and 1936 in Venezuela, in the 1937 Mexican oil

strike and in the 1945–6 strike in Iran. These conflicts were a training ground for later confrontations. A young labour activist in Baku, Joseph Stalin, later said that the advanced organizing skills of the Azeri oil workers and the intensity of their conflict with the oil industrialists gave him an experience that qualified him as 'a journeyman for the revolution'.[23]

However, the material qualities and physical locations of oil made things different from with coal. Since it comes to the surface driven by underground pressure, either from the water trapped beneath it or the gas above it, oil required a smaller workforce than coal in relation to the quantity of energy produced.[24] Workers remained above ground, under the continuous supervision of managers. Since the carbon occurs in liquid form, pumping stations and pipelines could replace railways as a means of transporting energy from the site of production to the places where it was used or shipped abroad. Pipelines were vulnerable, as we will see, but not as easy to incapacitate through strike actions as were the railways that carried coal. In addition, diesel oil and petrol are lighter than coal and vaporize more easily, and their combustion leaves little residue compared to the burning of coal. For these reasons, as Lewis Mumford noted:

> they could be stowed away easily, in odds and ends of space where coal could not be placed or reached: being fed by gravity or pressure the engine had no need for a stoker. The effect of introducing liquid fuel and of mechanical stokers for coal, in electric steam plants, and on steamships, was to emancipate a race of galley slaves, the stokers.
>
> (Mumford, 1934, p. 235)

The relative lightness and fluidity of oil made it feasible to ship it in large quantities across oceans. Historically, very little coal crossed oceans.[25] In 1912, Britain exported one-third of its coal and was responsible for two-thirds of the world's seaborne exported coal. But almost 90 per cent of its exports went to the adjacent regions of Europe and the Mediterranean (Jevons, 1915, pp. 676–84).[26] Over the course of the twentieth century, the proportion of coal exported internationally stabilized at about 15 per cent.[27] By contrast, from the 1920s onwards about 60 to 80 per cent of oil was exported (Podobnik, 2006, p. 79). So much oil was moved across oceans that, by 1970, 60 per cent of world seaborne cargo consisted of oil (Parker, 2001; UNCTAD, 2007, table 5, p. 8).[28]

Compared to carrying coal by rail, moving oil by sea eliminated the labour of coal-heavers and stokers, and thus the power of organized workers to withdraw their labour from a critical point in the energy system. Transoceanic shipping operated beyond the territorial spaces governed by the labour regulations and democratic rights won in the era of widespread coal and railway strikes. In fact, shipping companies could escape the regulation of labour laws all together (as well as the payment of taxes) by resorting to international registry, or so-called 'flags of convenience', removing whatever limited powers of labour organizing might have been left.

Unlike railways, ocean shipping was not constrained by the need to run on a network of purpose-built tracks of a certain capacity, layout and gauge. Oil tankers frequently left port without knowing their final destination. They would steam to a waypoint, and then receive a destination determined by the level of demand in different regions. This flexibility carried risks (in March 1967 it was one of the causes of the world's first giant oil spill, the Torrey Canyon disaster, which helped trigger the emergence of the environmental movement, a later threat to the carbon fuel industry), but it further weakened the powers of local forces that tried to control sites of energy production.[29] If a labour strike, for example, or the nationalization of an industry affected one production site, oil tankers could be quickly re-routed to supply oil from alternative sites. In other words, whereas the movement of coal tended to follow dendritic networks, with branches at each end but a single main channel, creating potential choke points at several junctures, oil flowed along networks that often had the properties of a grid, like an electrical grid, where there is more than one possible path and the flow of energy can switch to avoid blockages or overcome breakdowns.

These changes in the way forms of fossil energy were extracted, transported and used made energy networks less vulnerable to the political claims of those whose labour kept them running. At the same time, the fluidity and flexibility of oil presented new problems for those who owned or managed the production sites and distribution networks. It was no longer sufficient to control production and distribution in one particular region. Since oil could move easily from one region to another, petroleum companies were always vulnerable to the arrival of cheaper oil from elsewhere. This vulnerability, seldom recognized in accounts of the oil industry, set further limits to the democratizing potential of petroleum.

Market competition destroyed profits and ruined companies and had if possible to be prevented. The difficulty of transporting coal across oceans meant that coal producers faced competition only within their own region. They prevented it either by forming cartels, as in Germany and the United States, or creating new organizations to regulate production, such as the post-war European Coal and Steel Community. In Britain, producers were ruined by competition and taken over by the state.

Oil companies faced similar threats, but on a transoceanic scale. The two world wars helped restrict the supply and movement of oil, but between the wars both domestic firms in the United States, where most world oil was still produced, and the handful of oil companies seeking to control international trade needed a new set of mechanisms to limit the production and distribution of energy. The devices they developed included government quotas and price controls in the United States, consortium agreements to restrict the development of new oil discoveries in the Middle East and cartel arrangements to govern the worldwide distribution and marketing of oil. These controls shaped the development of the transnational oil corporation, which emerged as a long-distance machinery for maintaining limits to the supply of oil (Mitchell, 2002a). One could think of this development as the formation of what Barry (2006) calls

a 'technical zone', a set of coordinated but widely dispersed regulations, calculative arrangements, infrastructures and technical procedures that render certain objects or flows governable.[30]

After the Second World War, new devices were added to this machinery for the production of scarcity. There were two important techniques for transforming post-war carbon energy abundance into a system of limited supplies. The first was the new apparatus of peacetime 'national security'.[31] The war had given US oil companies the opportunity to reduce or shut down most of their production in the Middle East. In 1943, when Ibn Saud demanded funds to compensate for the loss of oil revenues, the oil companies persuaded Washington to extend Lend Lease loans to the Saudi monarch. These payments for *not* producing oil were presented as something necessary for America's national security. They marked the start of a long relationship in which Saudi collaboration in restricting the flow of oil was organized as though it were a system for 'protecting' the oil against others.

The second method of preventing energy abundance involved the rapid construction of lifestyles in the United States organized around the consumption of extraordinary quantities of energy. In January 1948, James Forrestal, recently appointed as the country's first Secretary of Defense under the new National Security Act, discussed with Brewster Jennings, President of Socony-Vacuum (later renamed Mobil Oil), how 'unless we had access to Middle East oil, American motorcar companies would have to design a four-cylinder motorcar sometime within the next five years' (1951, 6 January 1948, p. 2005).[32] In the following years the US car companies helped out by replacing standard six-cylinder engines with the new V8s as the dream of every middle-class family.[33] As Forrestal spoke, the Morris Motor Company in Britain was preparing to challenge the successful four-cylinder Volkswagen Beetle with the four-cylinder Morris Minor, Citroen to do the same with the two-cylinder 2CV and the German engine maker BMW with its first post-war passenger car, the one-cylinder Isetta 250. The European vehicles outsold and outlasted most of the badly-engineered American models. But the latter helped engineer something larger – carbon-heavy forms of middle-class American life that, combined with new political arrangements in the Middle East, would help the oil companies keep oil scarce enough to allow their profits to thrive.[34]

If the ability of organized workers to disrupt the networks and nodal points of a coal-based energy system shaped the kinds of mass politics that emerged, or threatened to emerge, in the first half of the twentieth century, this post-war reorganization of fossil fuel networks altered the energetics of democracy.

Oil and democracy

The points of vulnerability, where movements could organize and apply pressure, now included a series of oil wells, pipelines, refineries, railways, docks

and shipping lanes across the Middle East. The details of some of these struggles are worth recalling.

In Iraq, which Britain had reoccupied in 1941 less than a decade after being forced to grant the country formal independence, post-war protests culminated in the popular uprising and student and worker strikes of 1948. The Communist Party of Iraq, one of the best organized political movements in the region, demanded 'the evacuation of foreign troops, the unshackling of democratic freedoms ... [and] the provision of decent bread to the people' (prison letter from Comrade Fahd, early February 1948, cited in Batatu, 2004, p. 564). Batatu notes that the party had 'concentrated the weight of its force in the colossal enterprises that were ... most vital to the country', the railways, the port of Basra and the oilfields. This focus on the most vulnerable points in the technical structures of a petroleum-based system of production 'constituted the key to its basic strategy' (Batatu, 2004, p. 616).

In the railways, the party organized most of its resources at 'the most fundamental point in the entire system, the railway workshops at Schalchiyyah', where the main stores and all repair and maintenance work were concentrated. 'Stoppage of activity in this place for ten to fifteen days would have brought the movement of trains in the whole of Iraq to a complete standstill' (Batatu, 2004, p. 617). In the British-controlled oilfields, the party focused its activities at an even more vital site, 'the point of bifurcation of the Kirkūk–Haifa and the Kirkūk–Tripoli pipelines, the K3 pumping station near Ḥadīthah' (ibid., p. 622). A strike in June 1946 by oil workers demanding the right to a union, sickness and disability insurance, and a pension was crushed by force with ten workers killed and twenty-seven injured. During the 1948 uprising, however, the oil workers succeeded in shutting down K3. Since the pumping station supplied the gasoline for other pumping stations, the union posted guards to ensure that not 'even a pint of gasoline' got out. The stoppage lasted two weeks, until the company surrounded the site with machine guns and armoured cars and cut off supplies of food. Unable to risk an armed confrontation, the strikers decided to march on Baghdad, 250 kilometres away. After three days marching, and increasing support along the way, they 'entered Fallujah and fell into a police trap' (ibid., p. 624). The oil workers were sent back to K3, and the strike leaders to prison.

The other end of the Kirkuk-Haifa pipeline, in Palestine, provided another site of struggle. In the 1936–9 Arab revolt, the most sustained anti-colonial uprising against the British in the Middle East, a major target of the insurgency was the recently completed pipeline from Iraq. Initial efforts to weaken the British in August 1936 by organizing a strike at the oil refinery at Haifa, and at the port, the railway and the Public Works Department, were defeated when the British brought in Royal Navy engineers to run the trains and Jewish workers to run the port and the refinery (Lockman, 1996, p. 243). The pipeline was more vulnerable. Palestinian forces destroyed it for the first time near Irbid on 15 July 1936. They later blew it up several times near the villages of Kaukab

al-Hawa, Mahane Yisrael and Iksal, between 'Afula and Beisan, and at Tel 'Adas, al-Bira, 'Ard al-Marj, Tamra, Kafr Misr, Jisr al-Majami', Jinjar, Beisan and Indur (Kanafani, 1972, p. 109). Unable to protect the pipeline, the British created a force of armed Jewish settlers to assist with its defence, and to protect the Haifa–Lydda railway line (Kanafani, 1972).[35] This British-officered force was the nucleus of the Zionist army that seized control of Palestine in 1948.

The construction of a pipeline to carry petroleum from the oilfields of Saudi Arabia to the Mediterranean produced another set of political calculations and opportunities. The Trans-Arabian Pipeline Company, a joint venture by Exxon, Chevron, Texaco and Mobil, originally planned to terminate the pipeline near the British refinery at Haifa.[36] In 1946 they altered the route to avoid Palestine and terminate instead on the Lebanese coast near Sidon, passing through southern Syria. The reason given was the uncertain political future of Palestine, but this uncertainty may have included more than just the threat of Zionism. The British refinery, located at the terminus of the existing pipeline from Iraq, was a site of the 1936 strike already mentioned, of an earlier strike in February 1935 and of a thirteen-day strike for better wages in March 1947 (Lockman, 1996, pp. 327, 331). In the summer of 1947, Samuel Mikunis, Secretary of the Communist Party of Palestine, testifying in Jerusalem before the UN Special Committee on Palestine, raised a series of objections to the local political powers that the oil companies exercised:

> The oil refinery at Haifa (The Consolidated Refineries Limited) is a foreign concern exempted from all payment of customs duties. Monopoly concessions have been granted to the Iraq Petroleum Company and to the Trans-Arabian Oil Company. These concessions include the right – free of royalties, taxes, import duties or other payments, charges or compensations – to lay pipelines through any part of the country, to expropriate land, to seize any wood, stone, water and other local materials required, to import cheap labour regardless of existing immigration laws, to pass freely the border of Palestine, to build and use their own harbours, rail-roads, aerodromes and wireless stations, to exact port taxes for harbouring and loading, and to keep their own police force. The population of Palestine does not derive even cheaper oil and petrol from these concessions, granted by the Government without any consultation of the people.[37]

Re-routing the pipeline through Syria provided a way to avoid this kind of political contestation. When the Syrian parliament refused to ratify the terms of the agreement with the pipeline company, arguing for improved transit fees and a less one-sided US position on Palestine, the oil companies had the CIA organize a coup to put a more accommodating colonel in power. The new military government suspended parliament and the constitution and completed the pipeline agreement (Gendzier, 2006, pp. 97–8; Little, 2004, pp. 55–6). It was in events such as these that the post-war relationship between oil and democracy was engineered.

In Lebanon, the US pressured the government to sign a bilateral investment treaty that would exempt the oil companies from local labour law (Gendzier, 2006, pp. 111–14, 131–2). Labour protests beginning in the winter of 1943–4 that demanded union rights and improved pay and conditions had achieved the passage of a Labour Code in 1946 (Abisaab, 2004; Soltau, 1949, pp. 307–317; Thompson, 2000, pp. 277–81). Kamal Junblat, the Minister of National Economy, represented a reformist faction that opposed generous concessions to foreign multinationals and favoured the development of domestic manufacturing industry. His deputy warned that an earlier pipeline and refinery, the Kirkuk–Tripoli line that was the other branch from the K3 pumping station in Iraq, had provided little employment or local development. 'Two million tons of oil flow every year through Tripoli, but what does the huge installation represent in the economy of the town? Few perhaps know that a single cotton spinning and weaving plant in Tripoli itself employs four times as much labour as the whole Iraq Petroleum terminal and refinery together.'[38] In the final negotiations over the pipeline concession, the Americans secured Junblat's removal from office (Gendzier, 2006, pp. 47–8, 145). When the pipeline began operations, the US company used temporary employees and other measures to prevent the unionization of the workforce (ibid., pp. 112, 117).

In the case of Saudi Arabia, Vitalis (2006) has brought to light the extensive efforts of Aramco, the American-owned company with exclusive rights to the country's oil, to suppress labour organizing and political action.[39] The company imported the system of racially segregated workforces and worker housing that were familiar features of oil and other extractive enterprises in the United States. In the mid-1940s a labour movement began to emerge among the oil workers, demanding better treatment and an end to racial discrimination in living conditions. A ten-day strike in 1953 led to a promise of reforms and the imposition of martial law in the oilfields. When the promises were not kept, a wave of protests, stoppages and boycotts followed, culminating in a general strike in July 1956. The workers' demands included the introduction of a political constitution, the right to form labour unions, political parties and national organizations, an end to Aramco's interference in the country's affairs, the closure of the US military base and the release of imprisoned workers. Aramco's security department identified the leaders to the Saudi security forces and the leadership was imprisoned or deported.

There were similar pressures in Iran. In 1945–6, struggles for better pay and working conditions in the oil industry led to a series of strikes, including a three-day general strike in the refinery at Abadan and across the oilfields. The government gave in to the demands but then attempted to crush the union (Abrahamian, 1982; Halliday, 1978). In 1949–51 the union and its allies in the Tudeh Party (the communist party of Iran) re-emerged. As in Mexico in 1937, a reformist government tried to defuse the oil workers' power by nationalizing the country's oil industry, albeit on terms more favourable to the foreign oil company than those demanded by the union and the communist party. There followed a violent confrontation between the Mossadegh

government and the oil workers, whose leaders were arrested. However, the international oil companies refused to accept the nationalization, and in 1953 another CIA-organized coup re-established foreign control over the country's oil (Abrahamian, 2001).

In Iraq, a similar pattern of events followed the overthrow of the British-backed regime in 1958. The new leader, Abd al-Karim Qasim, survived the initial CIA attempts to assassinate him, including the gift of a monogrammed handkerchief laced with poison (Powers, 1979).[40] As an uneasy alliance with the oil workers and the communist party broke down, Qasim proceeded with plans to take back 99.5 per cent of the concession area granted to the foreign-owned Iraq Petroleum Company, leaving them only the currently producing fields in the north.[41] He was removed and assassinated in the CIA-supported coup of 1963 (Little, 2004).

If the construction of new energy networks replacing coal with oil was the basis for building a particular form of post-war democracy in Europe, those networks had different political properties from the coal-centred energy arrangements they replaced. Although the oilfields, pumping stations, pipelines and refineries of the Middle East became sites of intense political struggle, they did not offer those involved the same powers to paralyse energy systems and build a more democratic order.

The currency of oil

When the heads of the Trans-Arabian Pipeline Company were deciding the route for the transportation of oil from the Gulf to the Mediterranean, they briefly considered a southerly route terminating on the northern coast of the Sinai Peninsula in Egypt. Like Palestine, however, Egypt fell within the British sphere of influence. That raised a further problem besides the question of the troubles in Palestine. Egypt was a member of the sterling area, the group of former British colonies that issued their own local currencies but held their hard currency earnings in a central pool in London. In fact, Egypt and Iraq were the only non-Commonwealth members of this exchange mechanism.[42] The American company wanted to use the route of the pipeline to undermine the sterling area. A further advantage of running the pipeline through Syria and Lebanon was to assist with this financial engineering.

The struggle between 'sterling oil' and 'dollar oil' was part of a third set of linkages that were constructed between fossil fuels and the forms of mid-twentieth-century democracy: the mechanisms that tied together democracy in the West, flows of oil and the value of the US dollar.

The collapse of democracy in Europe in the 1920s and 1930s, the rise of fascism and the path towards world war were understood to have been caused by the collapse of the international financial system. In central and eastern Europe, countries were forced to abandon the attempt to base the value of their currencies on reserves of gold. One by one their domestic financial systems

collapsed, middle classes were pauperized and interwar democracy was destroyed. 'The breakdown of the international gold standard', wrote Karl Polanyi, was 'the mechanism which railroaded Europe to its doom' (1944, p. 20).

When the global financial order was reconstructed after the Second World War, it was based not on reserves of gold, but on flows of oil. Gold reserves could no longer provide the mechanism to secure international financial exchange, because the European allies had been forced to send all their gold bullion to America to pay for imports of coal, oil and other wartime supplies. By the end of the war the United States had accumulated 80 per cent of the world's gold reserves. The Bretton Woods Agreements of 1944 fixed the value of the US dollar on the basis of this gold, at $35 an ounce. Every other country pegged the value of its currency to the dollar and thus indirectly to the American gold monopoly. In practice, however, what sustained the value of the dollar was its convertibility not to gold but to oil. In both value and volume, oil was the largest commodity in world trade. In 1945 the United States produced two-thirds of the world's oil. As production in the Middle East was developed, and the routes of pipelines plotted, most of this overseas oil was also under the control of American companies. Under the peculiar arrangements that governed the international oil trade, the commodity was purchased in the currency neither of the country where it was produced nor of the place where it was consumed, but largely in US dollars. The rest of the world had to buy it using dollars.

The place of oil in international finance escapes most standard accounts of the post-war financial system.[43] Yet it was clearly understood in post-war planning documents.[44] John Maynard Keynes and Harry Dexter White, the main architects of the system, had argued for a third institution alongside the International Monetary Fund and the World Bank, to manage trade in oil and other essential raw materials.[45] The concern with oil was even visible in the sequence of meetings that established the new arrangements. Between the talks at Bretton Woods in July 1944 that established the post-war financial regime and those at Dumbarton Oaks in the autumn of the same year laying out the new international political order, a third meeting was held: representatives of Britain and the United States met in Washington in early August to draw up the post-war petroleum order. The Anglo-American Petroleum Agreement established an International Petroleum Commission to allocate production quotas and manage prices, much as the International Monetary Fund, created at Bretton Woods, would allocate borrowing quotas and manage the value of currencies (Feis, 1946; Stoff, 1981). The agreement provided an official successor to the 1928 cartel arrangement among the seven major US and British oil corporations, concerned largely with limiting the flow, managing the distribution and dividing the profits from the new oilfields of the Middle East. The Petroleum Commission scheme was the closest that planners came to realizing the public management of international oil production.

Domestic US oil companies used their influence in the Senate to kill the Petroleum Agreement, preferring existing arrangements whereby the Texas

Railroad Commission and other local regulators in the US set production quotas and prices to an international scheme. The following February, however, Roosevelt met with King Ibn Saud of Saudi Arabia, a meeting that is taken to mark the sealing of the arrangement that would replace the International Petroleum Commission for Middle Eastern oil. American corporations would manage the production and marketing of Arabian oil, in exchange for Washington's help in suppressing labour militancy and other populist threats to the oligarchs Britain had helped bring to power. Subsequently, the Marshall Plan paid for Europe to postpone plans to rebuild its battered coalfields and instead to purchase oil – supplied from the Middle East but paid for in US dollars.

Britain's attempt to defend the pound sterling as a rival international currency was a battle fought over oilfields. Oil was so large a component of its international trade that a 1955 report on the treatment of oil in the country's trade accounts suggested that 'the international ramifications of the oil industry (including its tanker operations) are so large and so complex as *almost to constitute oil a currency in itself*' (cited in Galpern, 2002, italics added).[46]

Europe and other regions had to accumulate dollars, hold them and then return them to the US in payment for oil. Inflation in the United States slowly eroded the value of the dollar, so that, when these countries purchased oil, the dollars they used were worth less than their value when they acquired them. These seigniorage privileges enabled Washington to extract a tax from every other country in the world, keeping its economy prosperous and thus its democracy popular.

If the working of carbon fuel networks helped engender certain concentrations of power and points of political vulnerability in the coal era, and these were transformed with the post-war transition to oil into new sites of democratic contestation and vulnerability, post-war democracy in Europe was also built on international financial exchanges organized upon the flow of oil. Post-war democracy in the West appeared to require a stable financial order, an order engineered with the help of oil wells, pipelines, tanker operations and the increasingly difficult control of oil workers. The fact that flows of oil were the basis for intersecting networks of global energy supply and global currency movements helped introduce a disjuncture that would become increasingly apparent by the end of the 1960s, leading to the 1971–4 energy–dollar Middle East crises. Before considering those interlocking crises, there is one more dimension of carbon democracy to explore, a dimension that will also be transformed in the 1971–4 crises: the mid-twentieth-century politics of 'the economy.'

The carbon economy

In a memorable passage in *The general theory*, John Maynard Keynes explains his novel theory of the economy in terms of bank notes buried in disused coal mines:

> If the Treasury were to fill old bottles with bank notes, bury them at suitable depths in disused coal mines which are then filled up to the surface with town rubbish, and leave it to private enterprise on well-tried principles of *laissez-faire* to dig the notes up again . . . there need be no more unemployment and, with the help of the repercussions, the real income of the community, and its capital wealth also, would probably become a great deal greater than it actually is.
>
> (Keynes, 1936a, p. 129)

British coal production had passed its peak in the 1920s. By the time Keynes wrote *The general theory*, coal-mines were being exhausted at an unprecedented rate.[47] William Stanley Jevons, the author of an earlier revolution in British economic thinking, marginalist theory of the 1870s, had published a book warning of the coming exhaustion of coal reserves (Jevons, 1865).[48] Keynes was reading that book as he published *The general theory*, and gave a lecture on Jevons in 1936 to the Royal Statistical Society (1936b).[49] It is indicative of the transformation in economic thinking in which Keynes played a role that the exhaustion of coal reserves no longer appeared as a crisis. The management of coal reserves could now be replaced in the mind, and in the textbooks of economics, with reserves of currency. In the era that Keynes's thinking helped to shape, the supply of carbon energy was no longer a practical limit to economic possibility. What mattered was the proper circulation of bank notes.

A fourth set of connections between oil and mid-twentieth-century democratic politics concerns the role of economic expertise and the economy. Like twentieth-century democracy, twentieth-century economic expertise developed in a specific relationship to the hydrocarbon age.

The shaping of Western democratic politics from the 1930s onwards was carried out in part through the application of new kinds of economic expertise: the development and deployment of Keynesian economic knowledge, its expansion into different areas of policy and debate, its increasingly technical nature and the efforts to claim an increasing variety of topics as subject to determination not by democratic debate but by economic planning and expertise.

The Keynesian and New Deal elaboration of economic knowledge was a response to the threat of populist politics, especially in the wake of the 1929 financial crisis and the labour militancy that accompanied the crisis and re-emerged a decade later. It provided a method of setting limits to democratic practice and maintaining them.

The deployment of expertise requires, and encourages, the making of worlds that it can master. In this case, what had to be made was 'the economy'. This was an object that no economist or planner prior to the 1930s spoke of or knew to exist. Of course the term 'economy' existed prior to the 1930s, but it referred to a process, not a thing. It meant 'government' or the proper management of people and resources, as in the phrase 'political economy' (Mitchell, 1998, 2005, pp. 126–41, 2008, pp. 447–66). The economy became the central object of democratic politics in the West (paralleled by the emergence of 'development'

outside the West): an object whose management was the central task of government, and which required the deployment of specialist knowledge.

The peculiar nature of the project of the 'national economy' deployed by Keynesian planners and colonial development officers and its relationship to forms of democracy can be seen by comparing it with a rival project, formulated at the same time and destined to overtake it: neo-liberalism. Launched at a colloquium in Paris organized in August of 1938 to discuss the work of Walter Lippmann criticizing the New Deal, as a movement against this new object of planning, the economy, and against planning itself as a method of concentrating and deploying expert knowledge, neo-liberalism proposed an alternative ordering of knowledge, expertise and political technology that it named 'the market' (Denord, 2001). This was not the market of David Ricardo or William Jevons, but a term that began to take on new meanings in the hands of the nascent neo-liberal movement. Drawing on Lippmann's warnings in *The phantom public* (1925) and *The good society* (1938) about the dangers of public opinion and the need to expand the areas of concern that are reserved to the decisions of experts, neo-liberalism was launched by Hayek and his collaborators as an alternative project to defeat the threat of populist democracy.

The development of neo-liberalism was delayed by the war and the programmes of post-war reconstruction. Its political challenge to the Keynesian consensus got under way a decade later, with the founding of a think-tank called the Institute of Economic Affairs in London in 1955. The launch was triggered by the first post-war crisis in the oil–currency system: Britain's attempt to preserve the sterling area as a mechanism of currency regulation, despite losing its control of the hub of that mechanism, the Anglo-Iranian oilfields in Iran. The desperate measures with which London tried to retain the pound's value despite the loss of the oil wells through which this value had been manufactured provided the point of vulnerability where the neo-liberal movement first aimed its weapons.[50]

Larger connections can be drawn between the assembling of 'the economy' and the transition from a coal-based to a predominantly oil-based energy system. The conception of the economy depended upon abundant and low-cost energy supplies, making post-war Keynesian economics a form of 'petroknowledge'. The economy was conceived in a particular way. It was not the total of the nation's wealth, something that had proven impossible to calculate. (There seemed no way to avoid continually counting everything twice, for example when wholesale goods were resold as retail.) It was imagined and measured, rather simply, as the phenomenon of bank notes changing hands. Even if it was the same money, every time it changed hands it was measured as part of the economy. The economy was the sum total of those monetary transactions (Mitchell, 2008).

This re-conceptualization defined the main feature of the new object: it could expand without getting physically bigger. Older ways of thinking about wealth were based upon physical processes that suggested limits to growth: the expansion of cities and factories, the colonial enlargement of territory, the

accumulation of gold reserves, the growth of population and absorption of migrants, the exploitation of new mineral reserves, increasing volumes of trade in commodities. All these were spatial and material processes that had physical limits. By the 1930s, many of those limits seemed to be approaching: population growth in the West was levelling off, the colonial expansion of the United States and the European imperial powers had ended and was threatened with reversal, coal-mines were being exhausted and agriculture and industry were facing gluts of overproduction. The economy, on the other hand, measured by the new calculative device of national income accounting, had no obvious limit. National income, later renamed the gross national product, was a measure not of the accumulation of wealth but of the speed and frequency with which paper money changed hands. It could grow without any problem of physical or territorial limits.

Oil contributed to the new conception of the economy as an object that could grow without limit in two ways. First, oil declined continuously in price. Adjusting for inflation, the price of a barrel of oil in 1970 was one-third of what it sold for in 1920.[51] So, although increasing quantities of energy were consumed, the cost of energy did not appear to represent a limit to growth. Second, thanks to its relative abundance and the ease of shipping it across oceans, oil could be treated as something inexhaustible. Its cost included no calculation for the exhaustion of reserves. The growth of the economy, measured in terms of GNP, had no need to account for the depletion of energy resources. The leading contributions to the academic formulation of the economy – Keynes's *General theory* (1936a), Hicks's *Value and capital* (1939), Samuelson's *Foundations* (1947) and the Arrow and Debreu (1954) model – paid no attention to the depletion of energy. The economics of growth of the 1950s and 1960s could conceive of long-run growth as something unrestrained by the availability of energy (Heal & Dasgupta, 1979, p. 1). Moreover, the costs of air pollution, environmental disaster, climate change and other negative consequences of using fossil fuels were not deducted from the measurement of GNP. Since the measurement of the economy made no distinction between beneficial and harmful costs, the increased expenditure required to deal with the damage caused by fossil fuels appeared as an addition rather than an impediment to growth (Daly, 1991). In all these ways, the availability and supply of oil contributed to the shaping of the economy and its growth as the new object of mid-twentieth-century politics.

The oil wells and pipelines of the Middle East and the political arrangements that were built with them helped make possible the idea of the Keynesian economy and the forms of democracy in which it played a central part.

The 1967–74 reorganization

With all this in mind, we can turn briefly to 1967–74 dollar–oil crisis, a pivotal episode in the story of post-war carbon democracy. The linked crises of the

US dollar and the nationalization of oil in the Middle East brought into play and reconfigured the intersecting elements of carbon democracy.

Again, by following the oil one can trace how relations between oil production, the gold standard, the circulation of dollars and Keynesian economic expertise were all transformed in the crisis, along with the possibilities for democratic politics in the Middle East. Following the balance of payments crisis of the late 1950s, and the pressure created by the accumulation of the unregulated offshore dollar reserves known as Euro-dollars, Washington had introduced oil import quotas to protect the value of the dollar and later tried to support its pegged gold price by interventions in the London gold market. When this scheme collapsed in November 1968, the US tried to transform Bretton Woods into a mechanism that allowed the gold peg to float. In an effort to lower domestic oil prices, Washington removed the controls on oil imports in 1970, but this caused more dollars to flow abroad. By the following year, the US had used up most of its non-gold reserves and only 22 per cent of its currency reserves were backed by gold. When European banks requested payment for their dollars in gold, the US defaulted. Described as 'the abandoning of the gold standard', it amounted to a declaration of bankruptcy by the US government.[52]

These developments coincided with the emergence of a politics of 'the limits to growth' as an alternative project to that of 'the economy' in which the oil companies helped trigger the production of the environment as a rival object of politics (Meadows, Meadows, Randers & Behrens, 1972; Schumacher, 1973). They did this in part inadvertently, by adopting ways of drilling and transporting oil that led to giant oil spills, around which environmentalists were able to organize. But they also helped produce the environment as a matter of political concern, by changing the way they calculated the world's reserves of oil.

In 1971 the oil companies abruptly abandoned their cornucopian calculations of oil as an almost limitless resource (calculations that had underpinned post-war theories of the economy as an object capable of limitless growth), and began to forecast the end of oil (Bowden, 1985). The recalculations were needed to deal with the threat posed by the new Ba'thist government of Iraq, which was developing the first major oil production in the region independent of any Western oil company. When the oil majors tried to punish Iraq by cutting their own production in the country, Baghdad responded by nationalizing their assets.[53] To dissuade other Gulf states from following Iraq's lead, the oil companies now sought to accommodate or even encourage their demand for an unprecedented increase in the price of oil, a goal already supported by agencies of the US government (Blair, 1976; Bromley, 1991; Oppenheim, 1976–7, pp. 24–57). A doubling or tripling of the price of oil would enable the major oil companies to survive the transition to a much lower share of Middle Eastern oil revenue, and would make it feasible to develop the less accessible, high-cost oilfields of the North Sea and northern Alaska. No model of the economy or its future growth could rationalize such an unprecedented transformation in costs of energy or flows of finance. But if

the world was reconfigured as a system of finite resources, rapidly running out, then entirely new calculations became possible.

The need to conserve environmental resources and protect them for the long term also helped with another calculation. For the oil companies, the large increase in oil prices carried a risk. It threatened to make affordable a rival source of energy, nuclear power. However, if the oil companies could force producers of nuclear power to introduce into the price of the energy they sold a payment to cover its long-term environmental effects – the cost of decontaminating reactors when they went out of service and of storing spent fuel for millennia – it would remain more expensive than oil. To promote such calculations, the oil companies joined the effort to frame the environment as a new object of politics, and to define it and calculate it in particular ways. Like the economy, the environment was not simply an external reality principle – against which the oil industry had to contend. It was a set of forces and calculations that rival groups attempted to mobilize.

The role of oil companies in framing the politics of the environment suggests another dimension of the relationship between oil and democracy: compared to the production of coal, oil production has a different way of deploying and distributing expertise. Earlier, I suggested that the democratic militancy of coal-miners could be traced in part to the autonomy that miners exercised at the coal face, especially prior to the large-scale mechanization of production. The autonomy of those who mined the ore placed a significant amount of expertise in their hands. Oil, in contrast, leaves its workers on the surface and distributes more of the expertise of production into the offices of managers and engineers.

This difference extends further. Once mined, coal is ready to use. It may require cleaning and sorting, but it needs no chemical transformation. Oil comes out of the ground in an unusable form, known as crude oil. The crude must be heated in a furnace, separated into its different hydrocarbons by fractional distillation, and further processed into useable and uniform products. Initially its main use was in the form of heavy oils (kerosene) for domestic lighting and for lubrication. Gasoline and other lighter by-products of the refining process were treated as waste. To increase their profit margin, oil companies developed large research and development divisions to find uses for these unused by-products, distribution and marketing divisions to promote their use and political and public relations departments to help build the kinds of societies that would demand them.[54] The major oil companies also collaborated to deny expertise to others, including the coal industry. The 1928 oil cartel, as Nowell (1994) has shown, was actually a broader hydrocarbon cartel, because it was an agreement not just to restrict the production of oil, but to prevent the use of patents that would allow coal companies to move into the production of synthetic oils.

Compared to coal companies, oil companies developed much larger and more extended networks for the production of expertise, which became increasingly involved in making of the wider world a place where its products

could thrive. For this reason, the international oil industry was well equipped to meet the challenge of the 1967–74 crisis. Facing both the demand from producer states for a much larger share of oil revenues and the rise of environmentalist challenges to carbon democracy, the major oil companies could draw upon a wide array of resources in public relations, marketing, planning, energy research, international finance and government relations, all of which could be used to help define the nature of the crisis and promote a particular set of solutions.

One other element in the 1967–74 reorganization deserves mention, given its importance to the question of democracy. As Nitzan and Bichler (2002) have shown, the crisis gave rise to a new set of relations between oil-producing countries and the United States, based on the selling of arms. The export of weapons by American and other manufacturers, previously a relatively small trade financed mostly through US overseas development aid, was transformed into a highly profitable commercial industry.[55] The real value of US arms exports more than doubled between 1967 and 1975, with most of the new market in the Middle East (SIPRI, n.d.). The commercialization of weapons exports was made possible by establishing a series of linkages between the Western import of oil from the Middle East, the flow of dollars to the producer countries, the production of political vulnerabilities and military threats to the further flow of oil and the use of the petrodollars to purchase arms from the West as protection against those threats. The 1967–74 crisis represented the work of connecting together these elements. The flow of weapons, and related opportunities in construction, consulting, military assistance and banking, now depended on new levels of militarism, and indeed on a US policy of prolonging and exacerbating local conflicts in the Middle East and on an increasingly disjunctive relationship with the Salafist forms of Islam that had helped defend the mid-twentieth-century oil order against nationalist and popular pressures in the region. The tensions between militarism, Salafism and armed conflict would render the prospects for a more democratic politics of oil production even weaker in the post-1974 period.[56]

Conclusion

This article has not attempted to draw up a general theory of democracy. General theories of democracy, of which there are many, have no place for oil, except as an exception. Rather, the goal has been to follow closely a particular set of connections that were engineered between carbon fuels and certain kinds of democratic and undemocratic politics.

The forms of democracy that emerged in leading industrialized countries by the middle decades of the twentieth century were enabled and shaped by the extraordinary concentrations of energy obtained from the world's limited stores of hydrocarbons and the socio-technical arrangements required for extracting and distributing that energy. When the production of energy shifted

to oil from the Middle East, however, the transformation provided opportunities to weaken rather than extend, both in the West and the Middle East, the forms of carbon-based political mobilization on which the emergence of industrial democracy had depended. Exploring the properties of oil, the networks along which it flowed, and the connections established between flows of energy, finance and other objects provides a way of understanding how the relations among these different elements and forces were constructed. The relations we have followed connected energy and politics, materials and ideas, humans and non-humans, calculations and the objects of calculation, representations and forms of violence, and the present and the future.

Democratic politics developed, thanks to oil, with a peculiar orientation towards the future: the future was a limitless horizon of growth. This horizon was not some natural reflection of a time of plenty. It was the result of a particular way of organizing expert knowledge and its objects, in terms of a novel world called 'the economy'. Innovations in methods of calculation, the use of money, the measurement of transactions and the compiling of national statistics made it possible to imagine the central object of politics as an object that could expand without any form of ultimate material constraint. In the 1967–74 crisis, the relations among these disparate elements were all transformed. Those relations are being transformed again in the present.

In their book *Afflicted powers* (Retort, 2005), Ian Boal and his colleagues have suggested that understanding the contemporary politics of oil involves the difficult task of bringing together the violence that has been repeatedly deployed to secure arrangements for the production of oil and the forms of spectacle and representation that seem somehow an equally effective aspect of the undemocratic politics of oil – not least the representation of the latest rounds of US militarism as a project to bring democracy to the Middle East.

We can better understand the relationship between spectacle and violence, and between other apparently disparate or discordant features of the politics of oil, by following closely the oil itself; not because the material properties or strategic necessity of oil determine everything else (on the contrary, as I suggested, a lot of hard work went into producing America's 'strategic dependence' on the control of Middle Eastern oil, starting with those V8 engines), but because, in tracing the connections that were made between pipelines and pumping stations, refineries and shipping routes, road systems and automobile cultures, dollar flows and economic knowledge, weapons experts and militarism, one discovers how a peculiar set of relations was engineered among oil, violence, finance, expertise and democracy.

These relations are quite different from those of the coal age. If the emergence of the mass politics of the early twentieth century, out of which certain sites and episodes of welfare democracy were achieved, should be understood in relation to coal, the limits of contemporary democratic politics can be traced in relation to oil. The possibility of more democratic futures, in

turn, depends on the political tools with which we address the passing of the era of fossil fuel.

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Notes

1 Ross (2001) demonstrates a negative correlation between oil exports as a percentage of GDP and degree of democracy, as estimated in the Polity dataset compiled by Keith Jaggers and Ted Robert Gurr (1995). The data are derived from an evaluation of the institutional procedures by which the candidate for chief executive is selected, elected and held accountable. The narrowness of this conception of democracy, the unreliability of its measurement and the assumption that diverse institutional arrangements can be compared and ranked as differing degrees of a universal principle of democracy are among the many problems presented by the data. Ross is unable to establish reasons for the statistical relationship between oil exports and Polity data ranking.

2 The problem of the rentier state was first formulated in Hussein Mahdavy (1970); subsequent contributions on the Middle East include Isam al-Khafaji (2004), Hazem Beblawi and Giacomo Luciani (1987) and Ghassan Salamé (1994). For other regions, see Karl (1997), Rosser (2007), Wantchekon (2002) and Yates (1996). Among economists, the problem of natural resources is posed in terms of obstacles to economic growth rather than democracy (Sachs and Warner, 1995). Goldberg, Wibbels & Mvukiyehe (2008) examine the impact of oil and other mineral wealth on American politics, showing that in states like Texas and Louisiana oil appears to cause lower rates of growth and make it less likely that opposition groups win elections.

3 An important exception to this tendency to ignore the materiality of oil in discussions of the rentier state is Fernando Coronil (1997), where the problem is connected to a wider erasure of nature in understanding the formation of wealth. See also Michael Watt's discussion (2004) of 'the oil complex' and the 'governable spaces' it requires and Robert Vitalis's examination (2006) of the labour regime and image-making that organized the production of oil in Saudi Arabia.

4 See Aleklett and Campbell (2003), Deffeyes (2005), Hubbert (1956) and Robelius (2007); on the history of peak oil estimates, see Bowden (1985) and Dennis (1985).

5 Research by James Hansen and his colleagues (2007) on palaeoclimate data suggests that feedback loops in the melting of ice can cause a rapid acceleration in the loss of ice cover, forcing much more extreme climate change with potentially cataclysmic consequences. These findings make even the dire warnings from the IPCC look absurdly optimistic. See also Hansen *et al.* (2008).

6 On the sociology of translation, and 'obligatory passage points', see Callon (1986). See also Mitchell (2002b, ch. 1).

7 Podobnik (2006, p. 5) calculates that coal replaced wood and other biomass materials as the main source of the world's commercial energy as early as the 1880s. But until well into the twentieth century the bulk of this fossil energy was consumed by just a handful of countries.

8 The use of coal (as well as peat, another fossil fuel) was already known in antiquity. But its use was generally restricted to the localities where it was found, and to particular trades that required large quantities of process heat, such as limestone burning and metal-smithing. Shortages of wood, especially in Britain, led to a gradual rise in the use of coal as a general substitute for wood from the sixteenth century (Sieferle, 2001, pp. 78–89).

9 Until recently it was assumed that coal reserves would long outlast oil, with plentiful supplies for hundreds of years. Recent studies suggest that estimates of coal reserves are even less reliable than those for oil, that production in the US, the country with the largest reserves, has already peaked and begun to decline and that global production may peak as early as 2025 (Zittel & Schindler, 2007). See also Iain Boal's warnings about risks of Malthusianism in discussions of oil depletion (Boal & Martinez, 2006).

10 Pollard (1981) documents the link between coal-producing regions (rather than states) and industrial development in Europe. See also Haberl (2006).

11 As Hobsbawm (1989, p. 88) points out, democratization came slowly. In most countries with systems of representative rule, property qualifications and registration procedures restricted the electorate to between 30 and 40 per cent of adult males. Voting rights for the majority of men, and for women, were won only in the twentieth century. For the restrictions in the British case, see Blewett (1965, pp. 27–56).

12 Britain also developed coal resources in the colonies – Natal and the Transvaal, parts of Queensland and New South Wales, and West Bengal. Coal production was also developed on a large scale in the Donets Basin in Russia, in the Illinois and Rocky Mountain basins in the United States, and in China.

13 The strike rate per 1000 employees for coal-mining and for all industries was, respectively, 134 and 72 (1881–6), 241 and 73.3 (1887–99), 215 and 66.4 (1894–1900) and 208 and 86.9 (1901–5) (Edwards, 1981, p. 106).

14 On the central role of the left in creating democracy in Europe, see Eley (2002). Coal was also associated with labour militancy beyond the main centres of the industrialized world. Quataert (2006) notes the repeated strikes among the workers of the Zonguldak coalfield on the Black Sea coast of Ottoman Anatolia. In Egypt, a strike by the coal-heavers at Port Said, the world's largest coaling station, in April 1882 is recorded as the first collective action by indigenous workers in the country. See Beinin and Lockman (1987, pp. 23, 27–31). However, without the linkages that connected coal to centres of industrial production within the country, these actions could not paralyse local energy systems and gain the political force they enjoyed in northern Europe and the United States.

15 Other discussions of relative autonomy of coal-miners and its loss under mechanization include Dix (1988) and Tilly and Tilly (1998, pp. 43–51).

16 'Labor's cause in Europe: the Kaiser's conference and the English strike', *New York Times*, 16 March 1890, p. 1.

17 In one of world's worst pit disasters, a gas explosion destroyed the Courrières mine on 10 March 1906, leaving 1100 dead (Neville, 1978).

18 Silver (2003, fig. 3.3, p. 98), shows that strikes were concentrated in these industries rather than in manufacturing.

19 Georges Sorel (1914 [1908]) offered another contemporary reflection on the new power of the general strike.

20 See Chernow (1998, pp. 581–90) and 'William Lyon Mackenzie King', *Dictionary of Canadian Biography Online*, retrieved 2 June 2008 from http://www.biographi.ca.

21 Prior to the development of North Sea oil in the 1970s, the only significant oilfields in Europe were in the Carpathian basin extending from southern Poland to Rumania. See Frank (2007).

22 See also Forrestal (1951, Vol. 7–8, 2 May 1947), Citino (2000, 2006) and Block (1977).
23 Stalin's words, from a 1926 speech to railway workers, are cited in Suny (1972, p. 373).
24 As oil is extracted the pressure in the reservoir drops. Pumps may then be used to bring more oil to the surface or to increase the reservoir pressure by driving water or gas into secondary wells.
25 The main exception was high-quality steam coal from South Wales, essential for the navy and fast liners, which was shipped to British coaling stations around the world (Jevons, 1915, p. 684). Historically, long-distance coal shipments from Britain could be used as ballast or make-weight and benefited from low rates for back-carriage (Jevons, 1865, p. 227).
26 Charles P. Kindleberger, an economist with the Office of Strategic Services in 1942–4, recalled that, at the outbreak of the Second World War, 'coal was regarded as something that didn't move across big bodies of water. It was shipped to British coaling stations but you wouldn't expect international transoceanic trade as a regular thing. And yet when the war came along, and we needed to get coal to Europe we started to move coal out. ... They were loading it in clam shell buckets on to barges in Puget Sound to go to Europe, a landing in Texas, Portland, Maine, everywhere' (McKinzie, 1973, pp. 108–9). After the Second World War, Japan built a steel industry based on coal and ore shipped from Australia.
27 In 2005, 86 per cent of world coal production was consumed within the country of production (IEA, 2005).
28 The figure refers to ton-miles of crude oil and oil products. In 1970 coal accounted for less than 5 per cent of seaborne trade.
29 The Torrey Canyon, an oil tanker owned by a Bermuda-based subsidiary of the Union Oil Company of California, registered in Liberia, chartered to BP, built in 1959 and rebuilt in 1966 in a Japanese shipyard to increase her size from 66,000 to 119,000 deadweight tons, ran aground off the coast of Cornwall in March 1967. The tanker had set sail without knowing its final destination, and lacked detailed navigation charts for the coast of south-west England. The damage to the coastline and to wildlife was exacerbated by the lack of methods to handle large oil spills. The British government tried to set fire to the oil by having air defence forces bomb it with napalm, creating further damage and inadvertently revealing their possession of the controversial weapon and the inaccuracy of the bombers (more than a quarter of the bombs missed their target) (Sheail, 2007; Cabinet Office, 1967).
30 Other raw materials presented similar problems of regulating global production to prevent competition. None of them, however, were as cheap to produce and transport as oil, or usable in such vast quantities, so they did not generate a need on the same scale for techniques for the production of scarcity.
31 Critical accounts of US international oil policy tend to accept 'national security' as the concept with which to frame the history of oil, exposing its true meaning either in terms of the logic of capitalist expansion that confronts an inevitable scarcity of resources, as in Klare (2001, 2008), or in terms of the need for an imperial power to secure the conditions for capitalist expansion, as in (Bromley, 1991, 2005). Explaining oil in terms of the logics of capitalist expansion leads such accounts to overlook the socio-technical work that must be done to turn the multiple struggles over oil into the singular narrative of the unfolding and stabilizing of the logic of capital. On the ability of the US oil majors to frame their programme in terms of 'national security', and the reproduction of this perspective in scholarship, see Vitalis (2006).
32 Forrestal made the same argument at a Cabinet meeting on 16 January 1948 (1951, p. 2026).
33 On the history of American attitudes towards energy, see Nye (1999).

34 Much more could be said about the role of the major oil companies and car manufacturers in helping to produce and popularize ways of living based on very high levels of energy consumption. This is not a question of balancing the history of oil production and distribution with an analysis of its consumption, so much as understanding that production involved both producing energy and producing forms of life that were increasingly dependent on that energy.

35 On the British–Zionist collaboration in defending the pipeline, see David Ben-Gurion, 'Our friend: what Wingate did for us', *Jewish Observer and Middle East Review*, 27 September 1963, pp. 15–16, reprinted in Khalidi (1971, pp. 382–7), and Leonard Mosely, *Gideon goes to war* (London: Arthur Barker, 1955), chapter 4, excerpted as 'Orde Wingate and Moshe Dayan', in Khalidi (1971, pp. 375–82).

36 The four corporations, then known as Standard Oil of New Jersey (Exxon), Standard Oil of California (Chevron), The Texas Company (Texaco) and Socony-Vacuum (Mobil), were (from 1947) the joint owners of Aramco, the company with exclusive rights to Saudi oil.

37 Testimony of Samuel Mikunis (Secretary of the Communist Party of Palestine), to UN Special Committee on Palestine, Public Hearing, Held at the YMCA Building, Jerusalem, Palestine, 13 July 1947, UN General Assembly, A/364/Add.2 PV. Retrieved 1 June 2008 from http://domino.un.org/UNISPAL.NSF/fd807e46661e3689852570d00069e918/77d468d8893712ce85256e83005fbc53, Previously a movement of both Palestinian Arabs and Jewish settlers, in 1943 the Palestine Communist Party had split into Arab and Jewish movements, but the Jewish factions, including the one led by Mikunis, continued until late 1947 to oppose the Zionist plan for a Jewish state in favour of Arab–Jewish cooperation (Lockman, 1996, pp. 303–51).

38 Na'im Amiouni [Amyuni], 'A short history of our pre-war and post-war economic problems', 3 July 1946, cited in Gendzier (2006, p. 48).

39 See also Vassiliev (2000).

40 See also United States Senate (1976) and Mitchell (2002b, pp. 148–9).

41 British Petroleum, the major shareholder in the Iraq Petroleum Company, had rejected Iraq's earlier proposal that IPC relinquish 60 per cent of its concession area (which covered the entire country) and give Iraq ownership of 20 per cent of the company. Following Iraq's decision to take back all non-producing parts of the concession, BP decided, in the words of the company historian, 'to wait out Qasim, hoping for a change of government' (Bamberg, 2000, p. 167).

42 For an explanation of the currency mechanism, see Zupnick (1955: 71–84). Egypt agreed to leave the sterling area in July 1947, hoping to convert its sterling balances, accumulated in London during the Second World War, into dollars. Shortly after, however, Britain broke the terms of the agreement by suspending the convertibility of Egypt's sterling balances (Leith-Ross, 1952, pp. 29–37).

43 Standard economic histories typically ignore the question of oil. For example, Eichengreen (2004) makes no mention of it.

44 See, for example, Dwyer (1949). Dwyer was Assistant Chief, Petroleum Branch, Economic Cooperation Administration (the US government agency that administered the Marshall Plan).

45 Harry Dexter White (1942) argued for an 'international essential raw material development corporation' whose function would be 'increasing the world supply of essential raw materials and assuring member countries of an adequate supply at reasonable prices'.

46 'In 1955, a paper prepared for the Working Party on the Treatment of Oil in the Balance of Payments, the Treasury and the Ministry of Fuel and Power wrote: ''The international ramifications of the oil industry (including its tanker operations) are so large and so complex as almost to constitute oil a currency in itself. Its size and complexity, and the fact that the fullest statistics are those relating to currency

movements, and that any other basis of treatment would mean very substantial corrections in a Balance of Payments account, are, in our view, sufficient reasons for treating oil differently from other trade." ' (Galpern, 2002, pp. xix–xx, citing 'Paper for the Working Party on the Treatment of Oil in the Balance of Payments', Note by the Treasury and Ministry of Fuel and Power, T.O. (55) 2, 28 January 1955, T 277/506).

47 On the peak of British coal production in the 1920s, see Bardi (2007) citing Kirby (1977) and Neuman (1934).

48 Jevons's son, H. Stanley Jevons, returned to the question of the exhaustion of coal reserves in Jevons (1915). He revised his father's estimate of the date of the possible exhaustion of British coal mines from one hundred years to 'less than two hundred years' (ibid., pp. 756–7).

49 Originally a lecture delivered on 21 April 1936. *The coal question* is quoted on p. 517.

50 'Fifty years ago this summer [in 1955] a little book was published in London. It was entitled *The Free Convertibility of Sterling* and was authored by an experienced financial journalist George Winder. In the front, Antony Fisher wrote as director of the Institute of Economic Affairs, "It [the book] is of vital concern to all those who are interested in their own freedom and the freedom of their country". Henry Hazlitt gave the book a brilliant review in *Newsweek* on July 25th 1955 and all 2,000 sold out. One can make a very good case for saying this was the start of the free market public policy institute movement that today encircles the world. That little book did so well that Fisher was emboldened to approach a young economist named Ralph Harris. Harris in turn saw a chance to do good by challenging the post World War II Keynesian consensus' (Blundell, 2005, p. 6).

51 The price of oil fell from $31 dollars a barrel in 1920 to $9 in 1970 (in 2006 prices). The average price per decade also declined, from $18 per barrel in the 1920s, to $15 per barrel in the 1930s and 1940s, $14 per barrel in the 1950s and $12 per barrel in the 1960s (BP, 2007).

52 Block (1977, pp. 164–202) makes no mention of the oil dimension of the crisis.

53 In 1961 Iraq had reduced the concession area of the foreign-owned Iraq Petroleum Company to the fields currently in production, in the Kirkuk region in the north. In 1969 Iraq had signed an agreement with the Soviet Union to help develop oil production in the south and to build a pipeline to a new refinery on the Persian Gulf. When production from the new field began in April 1972, IPC cut its production at Kirkuk by 50 per cent. The government nationalized IPC in June (Bamberg, 2000, pp. 163–71; Tripp, 2007, p. 200). Algeria had taken 51 per cent control of its French-owned oil industry in February 1971, and Libya began to nationalize foreign-owned oil production in December 1971. Syria had nationalized its small oil industry in 1964.

54 Podobnik (2006) discusses this question of the differing expertise relating to coal and oil.

55 In the 1950s about 95 per cent of US arms exports were financed by government aid; by the 1990s the figure was about 30 per cent (Nitzan & Bichler, 2002, p. 216).

56 Subsequent developments are discussed in Mitchell (2002a).

References

Abisaab, M. (2004). Unruly factory women in Lebanon: Contesting French colonialism and the national state, 1940–1946. *Journal of Women's History*, *16*(3), 58–82.

Abrahamian, E. (1982). *Iran between two revolutions*. Princeton, NJ: Princeton University Press.

Abrahamian, E. (2001). The 1953 coup in Iran. *Science and Society*, *65*(2), 185–215.
Aleklett, K. & **Campbell, C. J.** (2003). The peak and decline of world oil and gas production. *Minerals and Energy*, *18*(1), 5–20.
Al-Khafaji, I. (2004). *Tormented births: Passages to modernity in Europe and the Middle East*. London: I. B. Tauris.
Arrow, K. J. & **Debreu, G.** (1954). Existence of an equilibrium for a competitive economy. *Econometrica*, *22*(3), 265–90.
Bamberg, J. (2000). *The history of British Petroleum, Vol. 3, British Petroleum and global oil, 1950–1975: The challenge of nationalism*. Cambridge: Cambridge University Press.
Bardi, U. (2007). Peak oil's ancestor: The peak of British coal production in the 1920s. *Newsletter of the Association for the Study of Peak Oil and Gas*, *73* (January), 5–7.
Barry, A. (2006). Technological zones. *European Journal of Social Theory*, *9*(2), 239–53.
Batatu, H. (2004). *The old social classes and the revolutionary movements of Iraq: A study of Iraq's old landed and commercial classes and of its Communists, Ba'thists, and Free Officers*. London: Saqi Books.
Beblawi, H. & **Luciani, G.** (Eds.) (1987). *The rentier state*. New York: Croom Helm.
Beinin, J. & **Lockman, Z.** (1987). *Workers on the Nile: Nationalism, Communism, Islam, and the Egyptian working class, 1882–1954*. Princeton, NJ: Princeton University Press.
Blair, J. M. (1976). *The control of oil*. New York: Pantheon Books.
Blewett, N. (1965). The franchise in the United Kingdom 1885–1918. *Past and Present*, *32*(December), 27–56.
Block, F. (1977). *The origins of international economic disorder: A study of United States international monetary policy from World War II to the present*. Berkeley, CA: University of California Press.
Blundell, J. (2005). IEA turns 50: Celebrating Fisher meeting Hayek. *Atlas Investor Report*.
Boal, I. & **Martinez, D.** (2006). Feast and famine: A conversation with Iain Boal on scarcity and catastrophe. 3 January 2006. Available at http://www.word-power.co.uk/platform/Feast-and-Famine-A-Conversation.
Bowden, G. (1985). The social construction of validity in estimates of U.S. crude oil reserves. *Social Studies of Science*, *15*(2), 207–40.
BP (2007). *BP statistical review of world energy 2007*. Available at www.bp.com.
Bromley, S. (1991). *American hegemony and world oil*. University Park, PA: Pennsylvania State University Press.
Bromley, S. (2005). The United States and the control of world oil. *Government and Opposition*, *40*(2), 225–55.
Cabinet Office (1967). *The Torrey Canyon*. London: HMSO.
Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, action and belief: A new sociology of knowledge?*. London: Routledge.
Canning, K. (1996). *Languages of labor and gender: Female factory work in Germany, 1850–1914*. Ithaca, NY: Cornell University Press.
Chernow, R. (1998). *Titan: The life of John D. Rockefeller, Sr.* New York: Random House.
Church, R. A., Outram, Q., & **Smith, D. N.** (1991). The militancy of British miners, 1893-1986: Interdisciplinary problems and perspectives. *Journal of Interdisciplinary History*, *22*(1), 49–66.
Citino, N. J. (2000). Defending the 'postwar petroleum order': The US, Britain and the 1954 Saudi-Onassis tanker deal. *Diplomacy and Statecraft*, *11*(2), 137–60.
Citino, N. J. (2006). *The rise of consumer society: Postwar American oil policies and the modernization of the Middle East*. Paper presented at the 14th International Economic History Congress, Helsinki.
Corbin, D. (1981). *Life, work, and rebellion in the coal fields: The southern West Virginia miners, 1880–1922*. Champaign, IL: University of Illinois Press.

Coronil, F. (1997). *The magical state: Nature, money and modernity in Venezuela*. Chicago, IL: University of Chicago Press.

Daly, H. E. (1991). *Steady-state economics* (2nd edn). Washington, DC: Island Press.

Deffeyes, K. S. (2005). *Beyond oil: The view from Hubbert's Peak*. New York: Farrar, Straus & Giroux.

Dennis, M. A. (1985). Drilling for dollars: The making of US petroleum reserve estimates, 1921–25. *Social Studies of Science*, *15*(2), 241–65.

Denord, F. (2001). Aux origines du néo-libéralisme en France: Louis Rougier et le Colloque Walter Lippmann de 1938. *Le mouvement social*, *195*, 9–34.

Dix, K. (1988). *What's a coal miner to do? The mechanization of coal mining*. Pittsburgh, PA: University of Pittsburgh Press.

Dukes, J. S. (2003). Burning buried sunshine: Human consumption of ancient solar energy. *Climatic Change*, *61*(1-2), 33–41.

Dwyer, C. J. (1949). Trade and currency barriers in the international oil trade. 21 October. Walter J. Levy Papers, Box 22, Folder 4, American Heritage Center, University of Wyoming, Laramie, Wyoming.

Edwards, P. K. (1981). *Strikes in the United States, 1881–1974*. New York: St. Martin's Press.

Eichengreen, B. (2004). The British economy between the wars. In R. Floud & P. Johnson (Eds.), *The Cambridge economic history of modern Britain*. Cambridge: Cambridge University Press.

Eley, G. (2002). *Forging democracy: The history of the Left in Europe, 1850–2000*. New York: Oxford University Press.

Engels, F. (1939 [1873]). The Bakunists at work. In K. Marx & F. Engels (eds.), *Revolution in Spain*. London: Lawrence & Wishart (originally published in *Der Volksstaat*, 31 October, 2 and 5 November 1873).

Fagge, R. (1996). *Power, culture, and conflict in the coalfields: West Virginia and South Wales, 1900–1922*. Manchester: Manchester University Press.

Feis, H. (1946). The Anglo-American Oil Agreement. *Yale Law Journal*, *55*(5), 1174–90.

Forrestal, J. (1941–9). Papers. Princeton, NJ: Public Policy Papers Collection, Seeley G. Mudd Manuscript Library.

Forrestal, J. (1951). *The Forrestal diaries* (W. Millis & E. S. Duffield, Eds). New York: Viking Press.

Frank, A. F. (2007). *Oil empire: Visions of prosperity in Austrian Galicia*. Cambridge, MA: Harvard University Press.

Galpern, S. G. (2002). *Britain, Middle East oil, and the struggle to save sterling, 1944–1971*. Unpublished PhD dissertation, University of Texas, Austin.

Gendzier, I. (2006). *Notes from the minefield: United States intervention in Lebanon, 1945–1958* (2nd edn). New York: Columbia University Press.

Goldberg, E., Wibbels, E., & **Mvukiyehe, E.** (2008). Lessons from strange cases: Democracy, development, and the resource curse in the U.S. states. *Comparative Political Studies*, *41*(4–5), 477–514.

Goodrich, C. (1925). *The miner's freedom: A study of the working life in a changing industry*. Boston. MA: Marshall Jones.

Haberl, H. (2006). The global socio-economic energetic metabolism as a sustainability problem. *Energy*, *31*(1), 87–99.

Halliday, F. (1978). Trade unions and the working class opposition. *MERIP Reports*, *71*(October), 7–13.

Hansen, J., Sato, M., Kharecha, P., Russell, G., Lea, D. W., & **Siddall, M.** (2007). Climate change and trace gases. *Philosophical Transactions of the Royal Society A*, *365*, 1925–54.

Hansen, J., Sato, M., Kharecha, P., Beerling, D., Berner, R., Masson-Delmotte, V., Pagani, M., Raymo, M., Royer, D.L. & **Zachos, J.C.** (2008). Target atmospheric CO2: Where should humanity aim? *The Open Atmospheric Science Journal*.

Harrison, R. (Ed.) (1978). *Independent collier: The coal miner as archetypal proletarian reconsidered*. New York: St. Martin's.

Heal, G. M. & **Dasgupta, P.** (1979). *Economic theory and exhaustible resources*. Cambridge: Cambridge University Press.
Hicks, J. (1939). *Value and capital*. Oxford: Oxford University Press.
Hobsbawm, E. (1989). *The age of empire, 1875–1914*. New York: Vintage.
Hubbert, M. K. (1956). *Nuclear energy and fossil fuels*. Publication no. 95. Exploration and Production Research Division, Shell Development.
IEA (2005). *Coal in world in 2005*. International Energy Agency. Available at http://www.iea.org/Textbase/stats/index.asp.
IPCC (2007). *Fourth assessment report*. Geneva: Intergovernmental Panel on Climate Change.
Jaggers, K. & **Gurr, T. R.** (1995). Tracking democracy's third wave with the Polity III data. *Journal of Peace Research*, *32*(4), 469–82.
Jevons, H. S. (1915). *The British coal trade*. London: E. P. Dutton.
Jevons, W. S. (1865). *The coal question: An inquiry concerning the progress of the nation and the probable exhaustion of our coal-mines*. London and Cambridge: Macmillan.
Kanafani, G. (1972). *The 1936–39 revolt in Palestine*. New York: Committee for a Democratic Palestine.
Karl, T. L. (1997). *The paradox of plenty: Oil booms and petro-states*. Berkeley, CA: University of California Press.
Kerr, C. & **Siegel, A.** (1934). The interindustry propensity to strike: An international comparison. In A. Kornhauser, R. Dubin & A. M. Ross (Eds.), *Industrial conflict*. New York: McGraw-Hill.
Keynes, J. M. (1936a). *The general theory of employment, interest and money*. London: Macmillan.
Keynes, J. M. (1936b). William Stanley Jevons 1835–1882: A centenary allocation on his life and work as economist and statistician. *Journal of the Royal Statistical Society*, *99*(3), 516–55.
Khalidi, W. (Ed.) (1971). *From haven to conquest: Readings in Zionism and the Palestine problem until 1948*. Washington, DC: Institute for Palestine Studies.
King, W. L. M. (1918). *Industry and humanity: A study in the principles underlying industrial reconstruction*. Boston, MA, and New York: Houghton Mifflin.
Kirby, M. W. (1977). *The British coal mining industry 1870–1946: A political and economic history*. Hamden, CT: Archon Books.
Klare, M. (2001). *Resource wars: The new landscape of global conflict*. New York: Henry Holt.
Klare, M. (2008). *Rising powers, shrinking planet: The new geopolitics of energy*. New York: Metropolitan Books.
Leith-Ross, F. (1952). Financial and economic developments in Egypt. *International Affairs*, *28*(1), 29–37.
Lippmann, W. (1925). *The phantom public*. New York: Harcourt, Brace.
Lippmann, W. (1938). *The good society*. Boston, MA: Little, Brown.
Little, D. (2004). Mission impossible: The CIA and the cult of covert action in the Middle East. *Diplomatic History*, *28*(5).
Lockman, Z. (1996). *Comrades and enemies: Arab and Jewish workers in Palestine, 1906–1948*. Berkeley, CA: University of California Press.
Luxemburg, R. (1925 [1906]). *The mass strike, the political party, and the trade unions*. Detroit: Marxist Educational Society (originally published as *Massenstreik, Partei und Gewerkschaften*, 1906).
Mahdavy, H. (1970). The patterns and problems of economic development in rentier states: The case of Iran. In M. A. Cook (Ed.), *Studies in economic history of the Middle East*. Oxford: Oxford University Press.
McKinzie, R. D. (1973). Oral history interview with Charles P. Kindleberger, economist with the Office of Strategic Services, 1942–44, 1945; chief, Division German and Austrian Economic Affairs, Department of State, Washington, 1945–48; and Intelligence Officer, 12th U.S. Army group, 1944–45. Independence, Missouri: Harry S. Truman Library.
Meadows, D. H., Meadows, D., Randers, J., & **Behrens III, W. W.** (1972). *The limits to growth: A report for*

the Club of Rome's project on the predicament of mankind.

Mitchell, T. (1998). Fixing the economy. *Cultural Studies*, *12*(1), 82–101.

Mitchell, T. (2002a). McJihad: Islam in the US global order. *Social Text*, *20*(4), 1–18.

Mitchell, T. (2002b). *Rule of experts: Egypt, techno-politics, modernity*. Berkeley, CA: University of California Press.

Mitchell, T. (2005). Economists and the economy in the twentieth century. In G. Steinmetz (Ed.), *The politics of method in the human sciences: Positivism and its epistemological other*. Durham, NC: Duke University Press.

Mitchell, T. (2008). Culture and economy. In T. Bennett & J. Frow (Eds.), *The Sage handbook of cultural analysis*. Thousand Oaks, CA: Sage.

Mumford, L. (1934). *Technics and civilization*. New York: Harcourt, Brace.

Neuman, A. M. (1934). *The economic organization of the British coal industry*. London: George Routledge.

Neville, R. G. (1978). The Courrières colliery disaster, 1906. *Journal of Contemporary History*, *13*(1), 33–52.

Nitzan, J. & **Bichler, S.** (2002). The weapondollar-petrodollar coalition. In *The global political economy of Israel*. London: Pluto Press.

Nowell, G. (1994). *Mercantile states and the world oil cartel, 1900–1939*. Ithaca, NY: Cornell University Press.

Nye, D. E. (1999). *Consuming power: A social history of American energies*. Cambridge, MA: MIT Press.

Oppenheim, V. H. (1976–7). Why oil prices go up (1): The past: We pushed them. *Foreign Policy*, *25*(Winter), 24–57.

Painter, D. S. (1984). Oil and the Marshall Plan. *The Business History Review*, *58*(3), 359–83.

Parker, R. B. (2001). *The October war: A retrospective*. Gainesville, FL: University Press of Florida.

Podobnik, B. (2006). *Global energy shifts: Fostering sustainability in a turbulent age*. Philadelphia, PA: Temple University Press.

Polanyi, K. (1944). *The great transformation*. New York: Farrar & Rinehart.

Pollard, S. (1981). *Peaceful conquest: The industrialization of Europe, 1760–1970*. Oxford: Oxford University Press.

Pomeranz, K. (2000). *The great divergence: China, Europe, and the making of the modern world economy*. Princeton, NJ: Princeton University Press.

Powers, T. (1979). Strategic intelligence: Part one, an isolated man. *The Atlantic Monthly*.

Quataert, D. (2006). *Miners and the state in the Ottoman Empire: The Zonguldak Coalfield, 1822–1920*. New York: Berghahn.

Reifer, T. E. (2004). Labor, race & empire: Transport workers and transnational empires of trade, production, and finance. In G. G. Gonzalez, R. Fernandez, V. Price, D. Smith & L. T. Vo (Eds.), *Labor versus empire: Race, gender, and migration*. London and New York: Routledge.

Retort (Iain Boal, T. J. Clark, Joseph Matthews and Michael Watts) (2005). *Afflicted powers: Capital and spectacle in a new age of war*. New York: Verso.

Robelius, F. (2007). *Giant oil fields – the highway to oil: Giant oil fields and their importance for future oil production*. Unpublished PhD dissertation, Uppsala University.

Rodgers, D. T. (1998). *Atlantic crossings: Social politics in a progressive age*. Cambridge, MA: Belknap Press.

Ross, M. L. (2001). Does oil hinder democracy? *World Politics*, *53*(3), 325–61.

Rosser, A. (2007). Escaping the resource curse: The case of Indonesia. *Journal of Contemporary Asia*, *37*(1).

Sachs, J. D. & **Warner, A.M.** (1995). Natural resource abundance and economic growth. In *Development Discussion Paper* No 517a. Cambridge, MA: Harvard Institute for International Development.

Salamé, G. (Ed.) (1994). *Democracy without democrats? The renewal of politics in the Muslim world*. New York: I. B. Tauris.

Samuelson, P. A. (1947). *Foundations of economic analysis*. Cambridge, MA: Harvard University Press.

Sartre, J-P. (1977). *Critique of dialectical reason*, Vol. 1, *Theory of practical ensembles*. London: Verso.

Schumacher, E. F. (1973). *Small is beautiful: Economics as if people mattered*. New York: Harper & Row.
Sheail, J. (2007). Torrey Canyon: The political dimension. *Journal of Contemporary History*, *42*(3), 485–504.
Sieferle, R. P. (2001). *The subterranean forest: Energy systems and the industrial revolution*. Cambridge: The White Horse Press.
Silver, B. J. (2003). *Forces of labor: Workers' movements and globalization since 1870*. Cambridge: Cambridge University Press.
SIPRI (n.d.). Arms transfers database. Available at http://armstrade.sipri.org.
Soltau, I. C. (1949). Social responsibility in the Lebanon. *International Affairs*, *25*(3), 307–17.
Sorel, G. (1914 [1908]). *Reflections on violence* (T. E. Hulme, Trans.). New York: B. W. Huebsch (originally published as *Réflexions sur la violence*, 1908).
Stewart, R. (2006). *Occupational hazards: My time governing in Iraq*. London: Picador.
Stoff, M. B. (1981). The Anglo-American Oil Agreement and the wartime search for foreign oil policy. *The Business History Review*, *55*(1), 59–74.
Suny, R. G. (1972). A journeyman for the revolution: Stalin and the labour movement in Baku, June 1907–May 1908. *Soviet Studies*, *23*(3), 373–94.
Thompson, E. (2000). *Colonial citizens: Republican rights, paternal privilege, and gender in French Syria and Lebanon*. New York: Columbia University Press.
Tilly, C. & **Tilly, C.** (1998). *Work under capitalism*. Boulder, CO: Westview Press.
Tripp, C. (2007). *A history of Iraq*. Cambridge: Cambridge University Press.
UNCTAD (2007). *Review of maritime transport 2007*. Geneva: United Nations Commission on Trade and Development.
United States Senate (1976). *Final report of the select committee to study governmental operations with respect to intelligence activities* (6 vols). Ninety-Fourth Congress, Second Session. US Government Printing Office.
Vassiliev, A. (2000). *The history of Saudi Arabia*. New York: New York University Press.
Vitalis, R. (2006). *America's kingdom: Mythmaking on the Saudi oil frontier*. Palo Alto, CA: Stanford University Press.
Wantchekon, L. (2002). Why do resource dependent countries have authoritarian governments? *Journal of African Finance and Economic Development*, *5*(2), 17–56.
Watts, M. (2004). Resource curse? Governmentality, oil and power in the Niger Delta, Nigeria. *Geopolitics*, *9*(1), 50–80.
White, H. D. (1942). United Nations Stabilization Fund and a Bank for Reconstruction and Development of the United and Associated Nations. Preliminary Draft, March 1942, Chapter 3, p. 30. Harry Dexter White Papers, 1920–55, Box 6, Folder 6, Public Policy Papers, Seeley G. Mudd Manuscript Library, Princeton.
Yates, D. A. (1996). *The rentier state in Africa: Oil rent dependency and neocolonialism in the Republic of Gabon*. Trenton, NJ: Africa World Press.
Zittel, W. & **Schindler, J.** (2007). *Coal: Resources and future production*. EWG Paper no. 1/01, 10 July 2007. Available at http://www.energywatchgroup.org/files/Coalreport.pdf.
Zupnick, E. (1955). The sterling area's central pooling system re-examined. *Quarterly Journal of Economics*, *69*(1), 71–84.

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