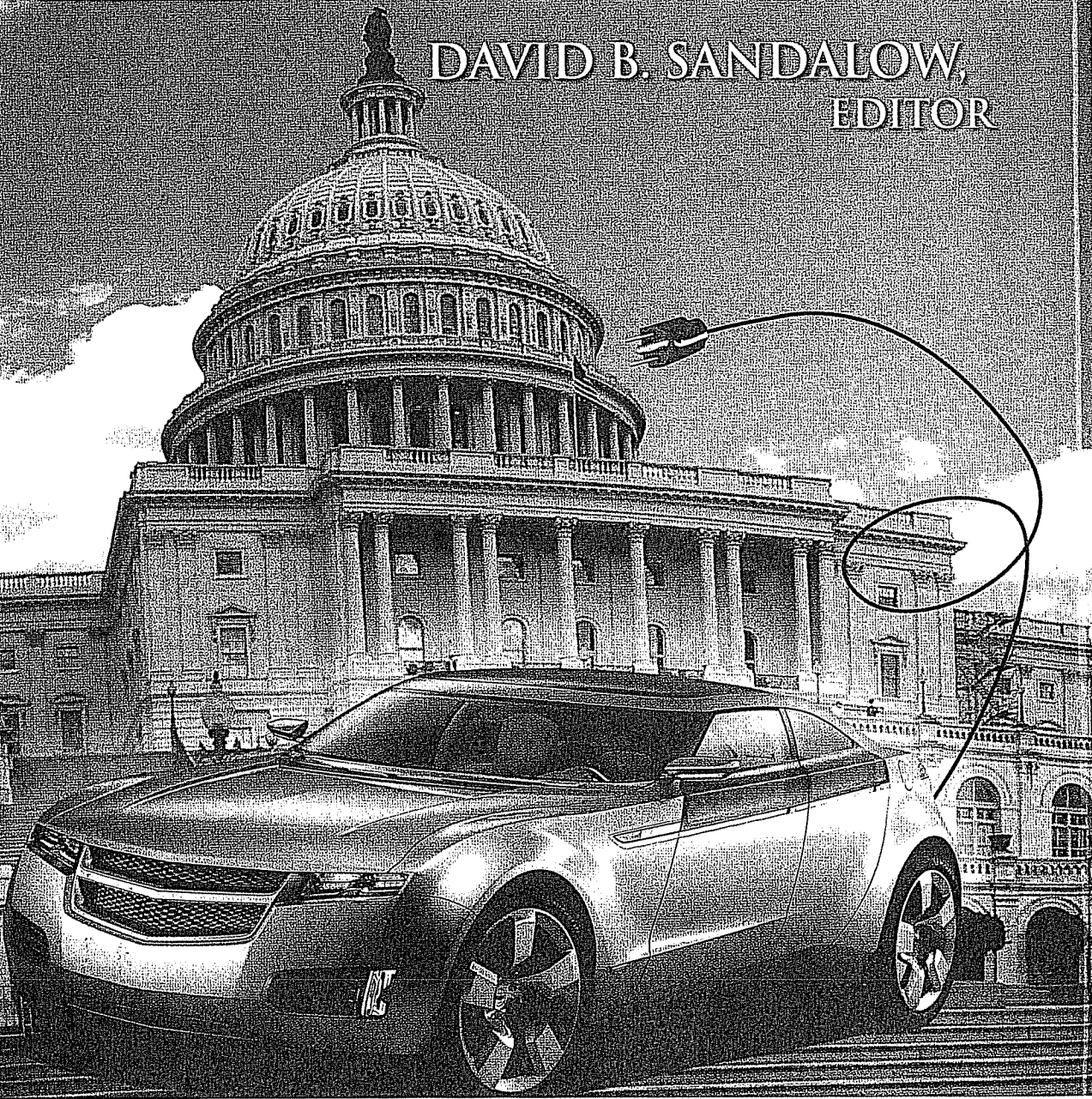


# PLUG-IN ELECTRIC VEHICLES

WHAT ROLE FOR WASHINGTON?

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## Geopolitical Implications of Plug-in Vehicles

R. JAMES WOOLSEY and CHELSEA SEXTON

There are many aspects of our dependence on oil for 97 percent of our transportation needs that affect both our national security in a traditional sense and, through the contribution of oil to climate change, our security in a broader sense as well. Yet the oil industry continues to enjoy a monopoly on transportation, receiving over the years the support of substantial subsidies and maintaining a close working relationship with the auto industry. So successful is this partnership that whole categories of transportation and fuel technologies have fallen victim to its interests, from streetcars in the 1960s to electric vehicles in the 1990s. Population and industrial growth around the world promises to add more and more people to the driving population—at a time when, given the current geopolitical climate, we can least afford it.

We do not believe that this country will achieve a sound energy policy if it ignores any of three key needs: to have a long-term supply of transportation fuel that is as secure as possible, as clean as possible (in terms of global warming gas emissions as well as other pollutants), and as inexpensive as possible. Today oil meets none of these three criteria. The reason that this is important to us is that oil is not merely a commodity; today, insofar as we are in near-total dependence on it for transportation, it is a strategic commodity. Until a little over a century ago, as Anne Korin has

Royal succession in Saudi Arabia could also bring major problems. King Abdullah is a sponsor of some reforms in the Saudi system and sometimes works toward cordial relations with us and other oil importers, but he is in his eighties, as is Crown Prince Sultan. Prince Nayef, the interior minister, is one possible successor to the throne. His views are famously close to those of the members of the extremely reactionary Wahhabi religious movement in the kingdom. Cordial relations with the United States may not be at the top of his agenda.

Iran's President Ahmadinejad is radical even by Iranian post-1979 standards. The efficacy of deterrence and containment in dealing with Iran's nuclear weapons development program is not clear when Iran's leaders talk of the desirability of Iran's becoming "a martyr nation" and shrug at the possibility of millions of deaths by saying "Allah will know his own."

In response to Iran's nuclear program, six Sunni Arab states, including Egypt and Saudi Arabia, announced in the winter of 2008 that they too would have "peaceful" nuclear programs. But since a number of those states have very plentiful supplies of oil and gas, it seems unlikely that all the programs will be limited to electricity generation. We may be seeing the beginning stages of a nuclear arms race in the Gulf region between Sunni and Shia, funded by our oil purchases.

Oil prices ranged in 2008 from \$35 to nearly \$150 per barrel, forcing the United States to borrow between \$1 billion every few days to \$2 billion per day to import oil. That contributes heavily to a weakening dollar and to upward pressure on interest rates (our annual oil debt is well above our trade deficit with China). If the IOUs we send abroad put a strain on our economy, the world's wealthiest, think what they do to the economies of developing countries—in, say, Africa—that have no oil themselves. Debt is the central inhibitor of economic development—importing expensive oil is helping to bind hundreds of millions of the world's poor more tightly in poverty.

A share of our payments for oil, along with a share of the payments of others, finds its way to Saudi Arabia. The Saudis contribute billions of dollars annually to their Wahhabi sect, which establishes religious schools and institutions throughout the world. In his book *The Looming Tower*, Lawrence Wright notes that with only a little more than 1 percent of the world's Muslim population, the Saudis support through the Wahhabis

pointed out, salt also was such a strategic commodity.<sup>1</sup> Wars were fought and national strategies driven in part by the demand for salt, because it was the only generally available means of preserving meat, a major portion of our food supply.

Today we have not stopped using salt, but no part of our national behavior is driven by the need for it—it has a market, and it is shipped in commerce. But because it has affordable and effective competitors for meat preservation—refrigeration, among other technologies—its dominant role is over. No nation sways world events because it has salt mines.

For a number of reasons we must strive to set oil on a similar path of decline in influence—away from being a strategic commodity and toward being simply a commodity. Oil will still be useful and valued for its high energy content and its relative ease of shipment for a long time. It will also be used in heating and in the production of some chemicals, although in those uses it is already, in a sense, no longer a strategic commodity because it has competitors. Doubtless it will be used for many years to produce transportation fuel as well. But in the interests of our national security, our climate, and our pocketbooks, we should now move together as a nation to destroy, not oil of course, but oil's strategic role in transportation as quickly and as thoroughly as possible.

### National Security

Our problems with oil derive in no small measure from the fact that more than two-thirds of the world's proven reserves of conventional oil lie in the turbulent states of the Persian Gulf, as does much of the oil industry's international infrastructure. Increasing our dependence on this part of the world for our transportation needs is subject to a wide range of perils.

In February 2006, in response to Osama bin Laden's many calls in recent years for attacks on oil infrastructure, al Qaeda attacked Abqaiq, the world's largest oil production facility, in northeastern Saudi Arabia. Had it succeeded in destroying—say, with a simple mortar attack—the sulfur-clearing towers there, through which about two-thirds of Saudi crude passes, it could have driven the price of oil to well over bin Laden's goal of \$144 a barrel, for many months. Another major al Qaeda attack on oil infrastructure in the Gulf region was thwarted in April 2007.

“90 percent of the expenses of the entire faith, overriding other traditions of Islam.”<sup>2</sup>

Wahhabi teachings, if one reads the fatwas of their imams—as set forth, for example, in Shmuel Bar’s *Warrant for Terror: Fatwas of Radical Islam and the Duty of Jihad*—are murderous with respect to the Shia, Jews, homosexuals, and apostates and horribly repressive with respect to everyone else, especially women.<sup>3</sup> They are essentially the same basic beliefs as those expressed by al Qaeda. The Wahhabis and al Qaeda do not disagree about underlying beliefs but, a bit like the Stalinists and Trotskyites of the 1920s and 1930s, about which of them should be in charge. The hate-filled underlying views of both, however, point in the same general direction. Many Wahhabi-funded madrassahs worldwide echo and perpetuate those views and thus promote their effects. Thus, as has often been said, when we pay for Middle Eastern oil today, the “Long War” against terrorism in which we are engaged becomes the only war, other than our Civil War, that we have ever fought in which we pay for both sides.

Finally, as Tom Friedman of the *New York Times* put it, “the price of oil and the pace of freedom always move in opposite directions.”<sup>4</sup> The work of various scholars has pointed out the link between commodities that command huge amounts of economic rent, such as oil (or the gold and silver brought from the New World by Spain in the sixteenth century), and political autocracy. Such a commodity, unless it is acquired by a mature democracy such as Norway or Canada, tends to concentrate and enhance its associated power in the hands of a ruler. Observing that Americans believe that there should be no taxation without representation, Bernard Lewis pointed out that the converse also is true: there is no representation without taxation.<sup>5</sup> If a country is so oil rich that it does not need taxes, it does not need, and often does not have, any real legislative body to levy them—and thus no alternative source of power in the state. And as for enhanced power from oil wealth, note the behavior in recent years of Messrs. Ahmadinejad, Chavez, and Putin.

So the national security reasons to move against oil as a strategic commodity are substantial. Shifting the trade patterns for oil does nothing to alleviate the problem in the grand scheme. There will always be someone else who will buy from these countries if we do not; all oil-importing nations are to a certain extent caught in the same net. Oil should thus be an early candidate for public policy decisions to speed its strategic demise.

Because there is no way to allow transportation to be dependent on oil and not ourselves be dependent, by extension, on the countries that have it, moving our vehicles off petroleum is the most significant step we can take toward breaking free.

### Climate Change

Today the clear weight of scientific opinion—for example, the views of the U.S. National Academy of Sciences—is on the side of the proposition that global climate change is in part anthropogenic and that it is related to the release of carbon dioxide (CO<sub>2</sub>) and other gases such as methane. And although critics are right to point out that earlier global predictions by others have not occurred—global cooling, massive famine from population increase—that should not affect our judgment about CO<sub>2</sub> and global climate change (except to give all of us a reasonable reminder of the importance of always holding scientific theories tentatively).

Oil contributes more than 40 percent of the global warming gas emissions caused by fossil fuels. Extrapolating from that, we might conclude that our purchases today of gas-guzzling SUVs can contribute, some decades hence, to sinking portions of Bangladesh and Florida beneath the waves. That possibility might once have been seen as a tangential issue to this chapter, were it not for the fact that more and more members of the defense and intelligence communities are recognizing that climate change is a national security issue. As certain resources become scarcer, as disease spreads, and as property is subjected to flooding and extreme weather events, we are likely to see increased migration from the affected areas, causing global tension and destabilization of trade. As a society, we are hesitant to examine our own choices, but they will leave us vulnerable nonetheless—pretending that this is not true because we cannot see the impact immediately does not change that fact.

### Strategic Investments

Certainly, individuals become interested in moving the United States (indeed the world) away from oil dependence for a number of reasons. Some are interested in protecting the environment, including from the effects of climate change. Some are especially worried about our increasing

dependence on the Middle East for oil and resentful of the use of oil revenues to spread doctrines that bolster terrorist ideology. But many are simply average Americans who are worried about how much it will cost to get to work tomorrow. Whether gasoline is \$2 or \$4 per gallon, the evolution of the collective discussion of independence from oil—from one of "if and when" to one of "how and now"—must continue. However, we cannot responsibly discuss the economics of the solution without considering the investment required to get there.

We have, as a country, made some substantial mistakes with regard to affordability in the past. Ignoring cost in attempting to destroy oil's strategic role in transportation is not only expensive, it is self-defeating. For example, in the aftermath of war, revolution, and oil crises in the Middle East in the 1970s, the United States initiated the very expensive Synfuels Corporation. It promptly went bankrupt in 1986 after the Saudis increased production from their reserves and drove the price of oil down to near \$5 per barrel. Something similar happened to various expensive petroleum alternatives in the late 1990s when, for a number of reasons, oil prices sank to around \$10 per barrel.

If we insist on seeking expensive single solutions (hydrogen comes to mind) as a silver bullet—ignoring completely the technological, economic, and infrastructure challenges—we will fail. That is in part because while oil is a strategic commodity for transportation for us, the importers, it also is a strategically manipulable commodity for those who control it. Chinese and Indian demand—and the possibility that the peak oil theory will prove true and the major Middle Eastern fields will see declining production capability—may move oil prices to high levels. But many investors will still be worried about a repeat of the sharp drops in oil prices of the mid-eighties and late nineties. The world changed in important ways in the early 1970s when the Railroad Commission of Texas was in effect replaced by OPEC as the arbiter of the world's oil prices.

We must make clear to all concerned that we will not allow our economy to be manipulated by others because they think that we are too aggressive in developing alternatives to oil or too determined in supporting the existence of Israel or for any other reason. Instead, we should develop a portfolio of approaches to breaking oil's strategic hold on us, building on existing transportation capabilities whenever possible and keeping in mind cost, carbon emissions, and national security.

## Solutions

By far the most promising path to the trifecta of cleaner, cheaper, domestic fuel is through electrification of transportation. As modern battery technology has developed in response to the markets for electronics, communications, power tools, and a host of other uses, it has brought with it the opportunity to substitute electricity for oil products in transportation. Promisingly, gasoline-based hybrid cars have now been provided with advanced batteries—such as lithium-ion—with improved energy and power densities.

Dozens of vehicle prototypes are now demonstrating that "plug-in hybrids" can more than double conventional hybrids' overall gasoline mileage. With a plug-in, charging your car overnight from an ordinary 120-volt outlet in your garage can provide twenty miles or more of electric range before the car lapses into its normal hybrid mode, using the liquid fuel in the tank as insurance when your trip exceeds that electric range. Other automakers are developing fully electric vehicles with ranges of 100 to 250 miles, well more than enough to meet most drivers' daily needs. And because electricity, at off-peak rates, can cost as little as a penny per mile while gasoline costs at a minimum will be several times higher, the average family will save a significant amount of money.

Even better for some drivers, the vehicles themselves require no compromise in the driving experience—any size or body style of vehicle can be electrified without affecting performance or safety, resulting in cars that are just as compelling as those that inspired the American love affair with the automobile in the first place. In the face of rising legacy costs, dwindling market share, and consumer demand for more efficient cars, many automakers have come around to accepting the notion of plug-in vehicles, and their development is fast becoming a horseshoe.

It should be noted that shifting to electricity is not completely without potential national security concerns. The electric grid in this country is woefully vulnerable to both accidents and terrorist attack on key physical or cyber components and to electromagnetic pulse attack with a nuclear weapon. A key mechanism to minimize the threat—in addition to the much-needed step of enhancing the security of our infrastructure against such attacks—is to encourage distributed generation of electricity.

Most people are familiar with the idea of distributed generation through the deployment of renewable technologies such as small-scale solar and wind power. Plug-in vehicles also serve the effort, through "vehicle to grid" (V2G) and "vehicle to home" (V2H) models, in which the vehicle is enabled to discharge electricity from its batteries back to the grid or to the home at peak times. V2G takes advantage of the often surprising fact that today's light-vehicle fleet has twenty times the power capacity of our electric power system and less than one-tenth its utilization. A relatively few vehicle batteries can thus store much larger amounts of energy relative to the grid's needs than most people realize. Others discuss this concept and its economic advantages in greater detail in other chapters dealing with grid capacity. But the role that vehicles can play in facilitating a distributed and more secure electric grid should not be understated. Encouraging such self-sufficiency at the local level makes us far more societally resilient.

In our view, even if the nation moves toward plug-in hybrid gasoline-electric vehicles and expected improvements in battery technology are made, there will be a substantial market for liquid fuels for some time. Some drivers will simply exceed the driving range afforded by the electric capacity of a plug-in hybrid. Others will want the psychological comfort of knowing that they have a liquid fuel safety net. Larger fleet vehicles and those used in moving goods are beginning to be electrified to a certain extent, but liquid fuels remain an important component for now. In addition to reductions in the cost of batteries, wide availability of public charging infrastructure may reduce the demand for liquid fuels over time. Meanwhile, it is crucial to shift our liquid fuel needs away from oil.

Cellulosic-based fuels—ethanol, methanol, and butanol—will in time exhibit cost advantages over corn-derived ethanol. For example, production of cellulosic ethanol is likely to be simplified by perfecting consolidated bioprocessing. That would permit multiple steps in deriving and fermenting sugars from cellulose and hemicellulose to take place together. Production costs may be lowered by crop yield improvements resulting from new genetic techniques, possibly but not necessarily including genetic engineering of feedstocks themselves. For example, this would simplify the breakdown of lignin in grasses or other feedstocks. And shipping costs may be lowered by locating small facilities near markets. Switch grass, for example, will grow in more parts of the country than corn, and it avoids the food-for-fuel arguments that corn can face. Bio-butanol may exhibit

similar advantages and also may profit from the fact that it is both more energy intensive and more pipeline friendly than ethanol.

Renewable diesel and other fuels, made by thermal or algae processes from many types of carbon-based waste—from turkey offal to rice straw to used tires—and P-Series fuels, made from waste and biomass, may exhibit cost advantages by charging tipping fees for environmental cleanup. Conversion of only a portion of agricultural, municipal, and animal wastes—using such processes now coming into commercial operation—appears to be able to yield several million barrels a day of diesel, or with modest further processing, methanol, and even aviation fuel.

In short, there is a good deal of promise that we may be able to shift our liquid fuel consumption toward renewable fuels that radically reduce our reliance on oil products. A key policy step to allow for a choice of liquid fuels is to ensure that virtually all new cars are flexible-fuel vehicles—cars that can run on any combination of gasoline and alcohols such as ethanol and methanol. Every car sold in the United States is required to have seatbelts and airbags; similarly, every internal combustion car should enable fuel flexibility, a feature that adds less than \$100 to the manufacturing cost of a vehicle and provides a platform on which fuels can compete.

Notably, for each of the billions of dollars a week that we can avoid borrowing for oil—and that we can figure out how to spend productively in producing domestic fuels for our transportation needs—we can create 10,000 or more jobs in the United States. Net U.S. farm income is in the range of \$80 billion a year. So by replacing about \$1 billion a week of our imports with domestic alternatives, we create value in this country about equal to a two-thirds increase in net farm income. At a time when auto plants are closing at an alarming rate and entire communities are suffering from seemingly instant and extensive unemployment, moving quickly to new propulsion systems and fuels for conventional vehicle models is the most promising strategy for the automotive industry.

Once plug-ins start appearing in showrooms, it is not only consumers and utility shareholders who will be smiling. If cheap off-peak electricity supplies a portion of our transportation needs, that will help insulate alternative liquid fuels from OPEC market manipulation designed to cripple oil's competitors. Future Indian and Chinese demand and peaking oil production may make it much harder for OPEC to use any excess production capacity to drive prices down and destroy competitive technology. As

plug-ins come into the fleet, low electricity costs will stand as a substantial further barrier to such manipulation. Since OPEC cannot drive oil prices low enough to undermine our use of off-peak electricity, it is unlikely to embark on a course of future radical price cuts at all because such cuts would be painful for its oil-exporting members. Plug-ins thus may well give investors enough confidence to back alternative liquid fuels without any need for new taxes on oil or subsidies to protect those fuels.

Even when the solution has been identified, incumbent companies have not always been good at getting out of their own way. As a result, the major automakers of the last century are being challenged by eager upstarts based in Silicon Valley, and it no longer is assumed that cars of the future will be sold by car companies at all. New business models for using batteries in cars are emerging almost as fast and in as many flavors as the batteries themselves. Advance purchase agreements will ensure that at the end of their useful life in cars, batteries will enjoy a second life in energy storage before finally being recycled a decade or two after they were first produced. Each of those factors contributes to our overall independence from oil as a society, as we climb on the wagon for good.

The role of consumers cannot be overlooked either. Much is made of the fuel price at which people will change their behavior: "At \$3 a gallon, people will stop driving their SUVs . . . OK, at \$4 a gallon," and so forth. But consumers will change their behavior only if they have a reasonable alternative to switch to—and obviously, each person has to decide for himself or herself what is reasonable. What we know for sure is that the best way to get people to use less oil is to give them the chance to use none, even for a portion of their daily driving. We can educate people to make better choices, but we have to give them those choices in the first place.

The principal effort of the federal government on these issues should be to remove market barriers to entry for alternative transportation fuels so that oil sees vigorous competition as a strategic commodity. That step will, if undertaken wisely, help introduce Americans and others sooner rather than later to practical alternatives in their daily lives—the ability to choose rather than being forced to take what OPEC decides to give us. There is no reason not to use our capacity for technological innovation to reduce our dependence on oil decisively—while avoiding fantasies of finding a single perfect solution. The audacity of the challenge is rivaled only

by the capacity of American ingenuity to meet it—luckily for us all, it is exactly the sort of challenge that can most engage the human spirit.

## Notes

1. Anne Korin, testimony before the House Committee on Foreign Affairs, *Rising Oil Prices, Declining National Security*, May 22, 2008 ([http://foreignaffairs.house.gov/110\(kor02208.htm\)](http://foreignaffairs.house.gov/110(kor02208.htm))); and R. James Woolsey and Anne Korin, *Turning Oil into Salt*, National Review Online, September 25, 2007 (<http://article.nationalreview.com/print/?q=OTlmMjFjYWRjOWI3ZGI0MzUxZDJjYTBiMmUzOTc2Mzcc=>).
2. Lawrence Wright, *The Looming Tower: Al-Qaeda and the Road to 9-11* (New York: Knopf, 2006), p. 149.
3. Shmuel Bar, *Warrant for Terror: The Fatwas of Radical Islam and the Duty of Jihad* (Lanham, Md.: Rowman & Littlefield, 2006).
4. Thomas Friedman, "As Energy Prices Rise, It's All Downhill for Democracy," *New York Times*, May 5, 2006 (<http://select.nytimes.com/2006/05/05/opinion/05friedman.html>).
5. From an interview on C-SPAN's *Booknotes* program, December 30, 2001, by host Brian Lamb with Lewis regarding his book *What Went Wrong?: Western Impact and Middle Eastern Response*: "You know, there's this old American dictum: no taxation without representation. What is sometimes overlooked is that the converse is also true: no representation without taxation" ([www.booknotes.org/Transcript/?ProgramID=1657](http://www.booknotes.org/Transcript/?ProgramID=1657)).