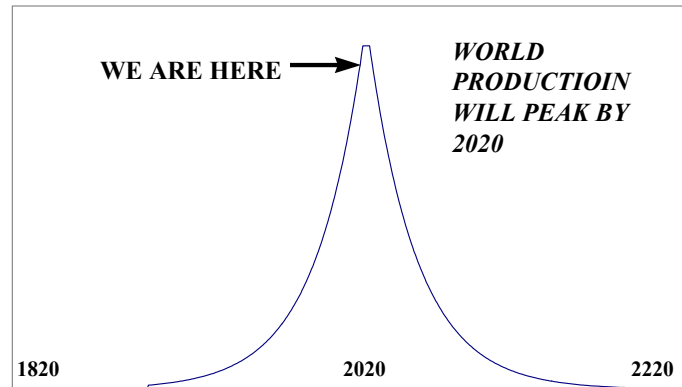


WHEN WILL THE JOY RIDE END?

BLACK MAGIC During the last century oil has transformed the world. British coal launched the Industrial Revolution, but American petroleum put the pedal to the metal. No other material has so profoundly changed the face of the world in such a short time. Petroleum is black magic, the lifeblood of our civilization. The petroleum industry provides 40% of the globe's energy and is humanity's largest commercial enterprise. Oil is our most concentrated, flexible, and convenient fuel. Without petroleum there would be no automobile industry, no tourism. Without petroleum 2% of Americans could not feed the remaining 98%. But oil is more than energy. It's the key feedstock for plastics, medicines, clothing, pesticides, paint, and thousands of other products.

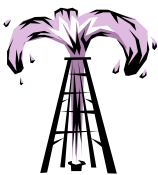
Fueling Toyota or fabricated into Tupperware, petroleum is the world's premier commodity. Soon, experts say, world oil production will reach an all-time high, an apex, a *peak*. Then, after a short plateau, it will decline forever. What historians will someday call the Oil Era will last only about 250 years. In 2000 we are closer to the Era's end than to its beginning.

THE OIL AGE:
A BRIEF FLING IN HUMAN HISTORY



THE OIL TRIBE In 1859 oil was struck in Pennsylvania. The magic fluid unleashed Yankee ingenuity, put America on wheels, and helped to create the world's richest superpower. The transformation was unimaginably swift: In 1859 Americans traveled on horseback; in 1969 they drove Mustangs and flew to the Moon. Today it is difficult to overstate oil's importance to our economy. Four percent of the world's people, we use 25% of the world's oil—nearly 20 million barrels per day. We are an Oil Tribe, the Petroleum Clan, imbibing about 3 gallons per person per day. The automobile is our most cherished icon, a new car our symbol of success. The local gasoline station is our secular temple where each week 150 million Americans “fill ‘er up.” An average American drives 1,000 miles a month, 12,000 miles a year, the distance to the Moon every 20 years. The Oil Tribe numbers 280 million. Hungry for speed, addicted to motion, we consume our weight in petroleum every 7 days.

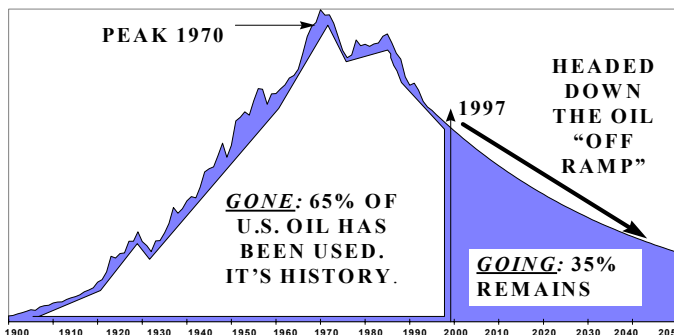
BLESSED BY GEOLOGY Cheap oil has always been an American birthright. Through fate and geology, the United States was extravagantly blessed. Our original cargo was about 280 billion barrels; only one country, Saudi Arabia, had more. Oklahoma alone possessed more oil than Germany or Japan. California had more than Germany, Japan, France, Spain, Denmark, Sweden, Finland, and Italy combined. The U.S. has—or rather *had*—20 times as much oil as India, 10 times as much as Brazil, 3 times more than China. Up to 1940 the U.S. produced two-thirds of the world's oil. After Japan attacked Pearl Harbor in oil-starved desperation and Hitler failed to capture Russia's Baku oil field, American petroleum, and the industrial output it nourished, triumphed in World War II.



This Petroleum Primer is published by the Community Office for Resource Efficiency. It was written by Randy Udall, CORE'S Director, with the able assistance of Steve Andrews, a Denver energy analyst. Three years ago, when the first edition appeared, oil was \$12 barrel and gasoline was 89¢ per gallon. Today, with oil at \$30 and pump prices pushing \$1.80, newspapers are full of irate letters to the editor excoriating Exxon's "price gouging" and urging the President to "show OPEC who's boss." This jingoistic chest-thumping, our typical response to gas hikes, is based on falsehood and ignorance. What's the real story? Read on.

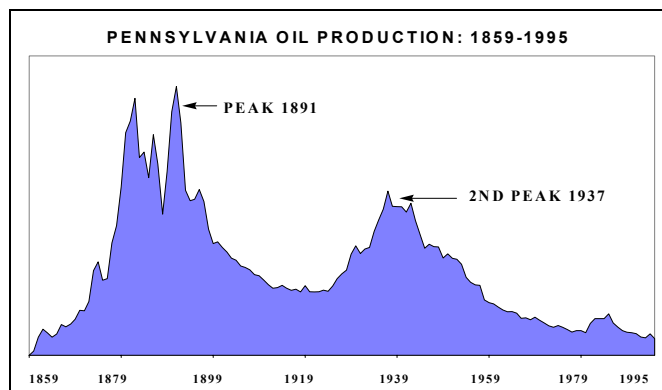
STRENGTH THROUGH EXHAUSTION In 1950 the U.S. produced half the world's oil. Fifty years later, we don't produce half our *own* oil. Domestic production peaked in 1970, 30 years ago, and today we produce just 45% of the crude we consume. To fuel our economy we've drilled more and pumped longer than any nation on Earth, pursuing an oil policy that's been called "Strength Through Exhaustion." The U.S. remains the world's third largest producer, but 65% of our known oil has been burned. It's downhill from here.¹

U.S. OIL PRODUCTION 1900 TO 2050



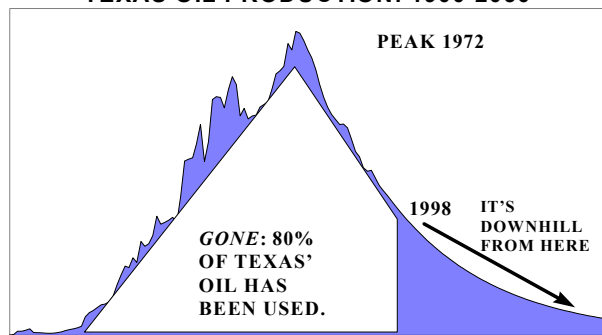
LIKE DEATH AND TAXES Perhaps for the same reason that State Farm sells life insurance rather than death insurance, oil companies shun words like *extraction* and *depletion*. Instead they prefer *production*, as in "Chevron produces oil." This implies that we can manufacture oil at will, the way we do jeans or computers. In truth, petroleum reserves are finite and depletion is a reality like death and taxes. To grasp this concept, consider Pennzoil. Our most famous motor oil honors the state where the Oil Age began in 1859. For the first 25 years of the Oil Era Pennsylvania was the world's leading producer. In 1891 the Quaker State produced 60% of America's oil. Today, it provides just 0.1%. The brand names live on, but the state's oil is history.

GUSHERS IN TEXAS As 19th century oil prospectors, some of them retired whalers, continued to harpoon the Earth, strikes were made in New York, Ohio,



A Pennsylvania oil well produces 15 gallons per day; an average well in Saudi Arabia, 231,000.

TEXAS OIL PRODUCTION: 1900-2050



Texas is gradually going out of the oil business.

and then Texas, America's first world-class find. If Texas had been a sovereign nation, its oil riches would have placed it in the world's top ten. The state's original reserves were 6 times greater than those of India, twice as large as Brazil or Norway. For the last 70 years Texas has been America's leading oil producer. But production peaked in 1972 and has been declining rapidly since. According to the American Petroleum Institute, about 80% of all the oil that will ever be produced in Texas is gone. Indeed, the state now imports about \$5 billion worth of oil each year. Texas is not an anomaly. Thirty-one states produce oil and all are past their peaks. Oklahoma peaked in 1927,

Colorado in 1956, Wyoming in 1970, Alaska in 1988, California in 1985.

SWISS CHEESE Well, if Pennsylvania and Texas are played out, why not drill more wells somewhere else? In fact, the U.S. is already one of the most thoroughly explored and drilled countries on Earth. Of the 4.6 million wells worldwide, 3.4 million have been drilled in this country. Very few prospects remain. With the exception of the Arctic National Wildlife Refuge and the deepwater Gulf of Mexico, we've been there and done that. From the oil industry's perspective, the U.S. is Swiss cheese. Indeed, tiny Kuwait has twice as much oil left as does the Lower 48.

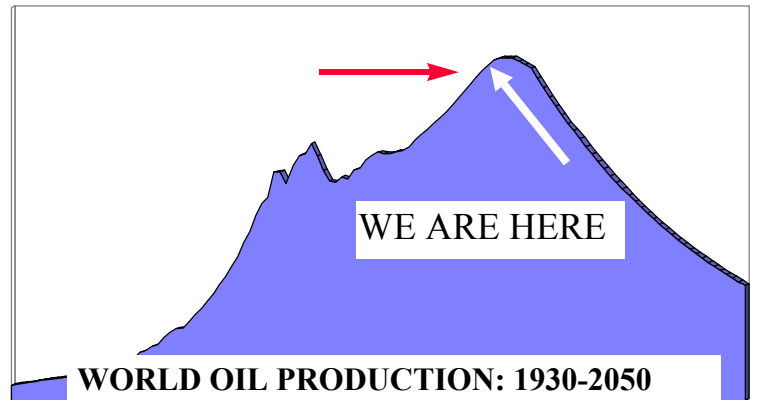
THE LAST HURRAH The oil industry employs hundreds of thousands of smart, inventive, and creative people. Many of their new exploration techniques, computer software programs, and drilling methods are being put to good use in the Gulf of Mexico. There, the oil majors are drilling in an astounding 9,000 feet of water. Analysts expect the Gulf to be America's last great bonanza. A mile under the ocean floor may lie 15 billion barrels. It's a lot of oil, but only as much as the nation uses every 2.5 years.

¹ **MORE INFO?** See *The Coming Oil Crisis* by Colin Campbell, *GeoDestinies* by Walter Youngquist, and *The Prize*, in text or video at libraries. Also: <http://ecotopia.com>, www.dieoff.org, www.BPamoco.com/worldenergy, <http://hubbert.mines.edu>, and http://energy.er.usgs.gov/products/papers/world_oil

CAR BOMB In 1900 oil married the automobile. Together they gave birth to a century of travel. Today most of the world's oil is consumed by cars, which are breeding like (VW) rabbits. In the last fifty years the human population has doubled. In the same period, car numbers have grown *tenfold* from 50 to 500 million. Autos are reproducing five times faster than people. A new car is born each second, and the global automobile population now consumes three times more energy in the form of oil as humans consume in the form of food.

THE COMING PEAK The global economy uses 77 million barrels of oil per day. That oil propels every car in Canada, China, and Chile. Every Boeing, every Airbus. By 2010 experts say the world will consume 90 million barrels a day, 20% more than today. Sometime between now and 2010, world oil production will reach an all-time high, a *peak*. A plateau in production will be followed by a relentless inexorable decline. The exact year of the world peak can't be predicted, since it will depend as much on economic and political factors as on geology. The biggest wild card? Saudi Arabia, the world's most prolific oil province. If the Saudis invest hundreds of billions of dollars they could increase their output to meet growing demand. But they may decide not to, choosing instead to produce less oil and charge more for it. Although predicting the peak is impossible, this momentous event is near.

A GREAT TURNING POINT



COLLISION IN SLOW MOTION A *decline* in oil production? After a century of increases, what seems unlikely is now inevitable. The next crunch may arrive suddenly. Or in slow motion. As former Energy Secretary Don Hodel says, "We're sleepwalking to disaster." When it happens, journalists will shout, "We're running out of oil." That's not true. Rather, we are running out of *cheap* oil. After production peaks oil will be readily available at a higher price, though in declining amounts, for 50 years. No one will freeze in the dark (America's reserves of natural gas and coal should last 40 years and 120 years respectively), but the transition to expensive oil may be bumpy.

OPEC'S RETURN American production has been declining for 30 years. As we produce less oil, we must import more. Indeed, America *imports* more oil than any other nation *uses*. Uncle Sam's appetite is gargantuan. And why not, because even at \$30 a barrel, imported oil is a steal. The tab for 2000 will be about \$100 billion, about 1.2% of the gross domestic product. But this bargain may not last. As population rises, more people will be competing for less oil. By 2015, only a handful of nations will be exporting significant quantities, and the Organization of Petroleum Exporting Countries (OPEC) will be able to control prices at will. Since Saudi Arabia, Iran, Iraq, and Kuwait can sustain their projected production past 2020, the world will not suddenly run out of oil. But \$25 a barrel will be a thing of the past.

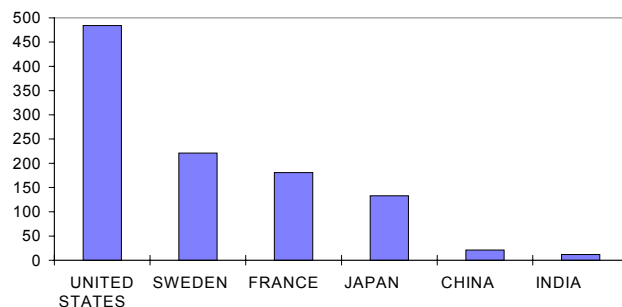
THEY GOT IT, WE WANT IT Fully two-thirds of the world's remaining oil is in five Muslim countries. This chart explains why Iraq's Saddam Hussein gets press, why the State Department frets about Iran, and why the U.S. fought the 1990 Gulf War. (Bush Senior: "Our way of life is at stake.") The energy future of America, Japan, Europe, and China are inextricably linked to the Middle East. In the Saudi deserts the U.S. military has built fortified air bases. Ostensibly we are there to protect our Saudi friends. In reality, we are an occupying force protecting our access to their oil. Some Saudi Muslims are resentful of our presence, as we would be if they had air bases in Nevada. Would we leave Saudi Arabia if asked? Good question.

GOT OIL		USE OIL	
• SAUDI ARABIA	26%	• U.S.	25%
• IRAQ	10%	• JAPAN	8%
• KUWAIT	10%	• CHINA	5%
• ABU DHABI	9%	• RUSSIA	4%
• IRAN	9%	• GERMANY	4%
• VENEZUELA	6%	• S. KOREA	3%
• RUSSIA	5%	• ITALY	3%
• MEXICO	5%	• FRANCE	3%
• U.S.	3%	• ENGLAND	3%

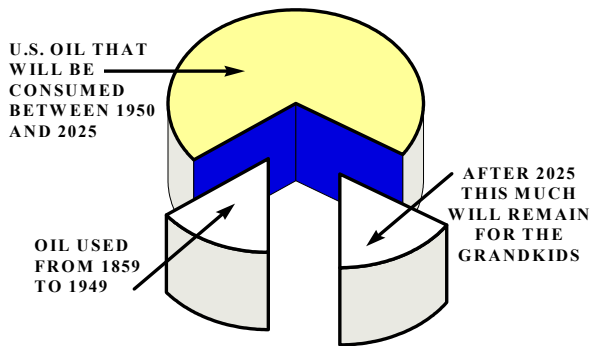
Left, five countries in the Mideast have two-thirds of the world's oil. Right, the U.S. uses three times more than Japan, eight times more than England.

ROAD WARRIORS Fish don't worry about water and Americans don't worry about oil. Instead we swim in it. Think of your life: skiing on the weekend, Thanksgiving at mom's, a conference in Chicago. Middle-class Coloradans do their Christmas shopping in Minnesota at the Mall of America. Texans drive 1,000 miles to shoot a Colorado elk, hunting-and-gathering taken to new extremes. Of course, petroleum doesn't just propel us. It feeds us too. Oil is absolutely fundamental to agribusiness: the average potato travels 750 miles.

**ANNUAL GASOLINE CONSUMPTION:
GALLONS PER PERSON**



AMERICA'S OIL: DIVIDING THE PIE



FROM THE CRADLE TO THE GRAVE More than half the world's oil—and 70% of U.S. oil—will be consumed during the Baby Boomers' lifetime. The Boomers were conceived as auto culture kicked into overdrive. As teens they grooved on *Mustang Sally* and *Little GTO*. Getting a driver's license was their rite of passage. During their lives many Baby Boomers will drive and fly a million miles, equal to 40 trips around the globe. Magellan and Amelia Earhart were the famous circumnavigators of their day. Now every man is Magellan, every woman Amelia.

WHO WILL FUEL CHINA? From Asia to Africa, three billion people crave an automobile lifestyle and who can blame them? Mobility is wonderful. But India has little oil and China's hopes for new discoveries have not been realized. If India and China imported as much oil per person as we do, world production would have to *triple*. It can't; there's not enough oil. Looking ahead, the tremendous inequities in oil distribution—and consumption—are morally troubling and militarily worrisome. As Americans continue to guzzle and more Asians take to the road, oil demand will eventually outstrip oil supplies. Prices will rise. Economic jousting for oil—who can pay most—is certain. Military confrontation can't be ruled out. With the U.S. using three times more oil than any other nation, future generations of young Americans may be forced to take the battlefield once more for oil.

LIFE IN 2050 Each year the relentless aging of existing oil fields removes 5 million barrels/day from global production. Is there a miracle cure? Exciting advances include horizontal drilling and 3D imagery to recover more oil from aging fields; technology to convert natural gas to a diesel-like fuel; innovative autos powered by hybrid drives and fuel cells; telecommuting, the Internet and other social changes that may reduce oil consumption. All buy us time. But depletion remains a powerful foe: Every day the world uses 77 million barrels while finding 15 million. By 2050 nine billion people will have only as much petroleum as three billion did in 1950. Oil will be more expensive, perhaps dramatically so. Is this a Doomsday message? No. A more sustainable world may be a better place in which to live. The challenge is getting from here to there. The longer we wait, the harder the transition.

EASING THE TRANSITION Exxon, Shell, and British Petroleum own less than 10% of the world's remaining crude. This means that future prices will be largely determined not by CEOs in Houston and London, but by Iraqi dictators, Saudi sheiks, and the leaders of Iran, Iraq, Kuwait, Venezuela, Nigeria, and Russia. This does *not* mean we are powerless. Indeed when America gets serious about safeguarding its energy future, there are many things we can do. First, we need much more efficient cars. The physics of today's Pontiac (or pickup) are absurd. We already know how to build safe 35 mpg SUVs and roomy 50 mpg family sedans, let's do it! Congress must tighten federal fuel standards and close loopholes the size of a Ford Excursion. Let's invest in mass transit and stop designing cities and suburbs around the car. Consumers need accurate signals about the true cost of driving. Pay-at-the-pump auto insurance, where liability coverage is rolled into the fuel cost, is one approach. Hiking gas taxes by 10¢/gallon each year for the next ten years is another. (This tax could be offset by tax credits for low-income families.) Our half-hearted efforts to promote natural gas and other alternative fuels could be strengthened. Of course, before such bold policies can be adopted, Americans must first come to recognize that petroleum is among the world's most valuable resources, a gift of geology, a precious one-time windfall... which we are wasting as if there's no tomorrow.

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