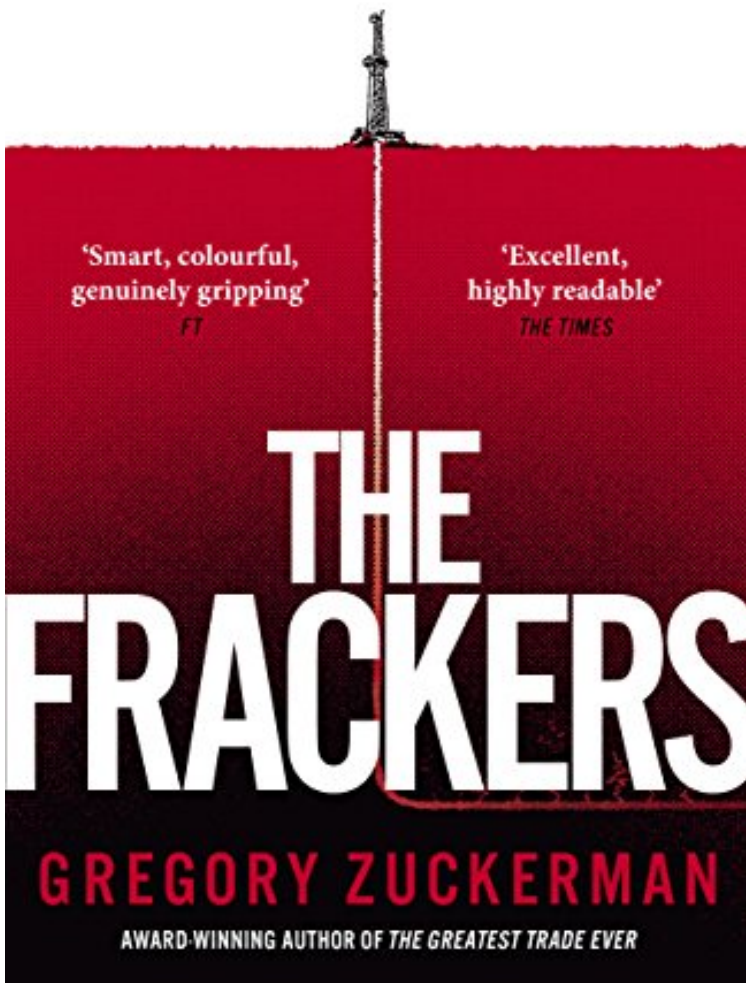


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# The Frackers: The Outrageous Inside Story of the New Energy Revolution

'Remarkable . . . A great read,  
whether you are pro-fracking or against it'

MATTHEW BISHOP, *THE ECONOMIST*



Par Gregory Zuckerman  
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## Description :

Prsentation de l'diteurThe Frackers by Gregory Zuckerman, bestselling author of The Greatest Trade Ever, tells the untold story of the tycoons behind the US fracking controversy. Things looked grim for American energy in 2006. Oil production was in steep decline and natural gas was hard to find. The Iraq War threatened the nation's already tenuous relations with the Middle East. China was rapidly industrializing and competing for resources. Major oil companies had just about given up on new discoveries on US soil, and a new energy crisis loomed. But a handful of men believed everything was about to change. By experimenting

with hydraulic fracturing through extremely dense shale - a process now known as fracking - these 'wildcatters' started a revolution. In just a few years, they solved America's dependence on imported energy, triggered a global environmental controversy - and made and lost astonishing fortunes. The frackers have already transformed the economic, environmental, and geopolitical course of history, and like the Rockefellers and the Gettys before them, they're using their wealth and power to influence politics, education, entertainment, sports, and many other fields. Activists argue that the same methods that are creating so much new energy are also harming our water supply and threatening environmental chaos. Award-winning reporter Gregory Zuckerman gained exclusive access to the frackers, chronicling the untold story of how they transformed the nation and the world. The result is a dramatic narrative that stretches from the barren fields of North Dakota to the tense Wall Street boardrooms. The Frackers also tells the story of the angry opposition unleashed by this revolution, and explores just how dangerous fracking really is. Gregory Zuckerman is a special writer at The Wall Street Journal and the bestselling author of The Greatest Trade Ever. He is a two-time winner of the Gerald Loeb Award and a winner of the New York Press Club Journalism Award.

INTRODUCTION

William Butler was up nights, full of worry. The grizzled eighty-three-year-old rancher in South Texas owed millions of dollars to various lenders, had almost nothing in the bank, and feared his two sons wouldn't be able to manage when he was gone. Butler had the look of someone just off the set of a John Ford movie. Tall and broad, he tended his cattle in a flannel shirt, blue jeans, and muddy boots. He went by the nickname Buck, spent seven days a week working with thousands of cows on his ranch, and in his old age relied on a walking stick made from the manhood of a two-thousand-pound Brahma bull. Buck Butler was no cinema hero, however. A series of local schemers and connivers had taken advantage of him over the years. Butler compounded his problems by plowing all his free cash into nearby land, usually telling his nervous wife, Vera, about the purchases only after they had been completed. By 2009, Butler faced growing difficulties with his business and was coping with a nervous system disorder. Vera began taking medication to calm her own nerves. When you owe over three million dollars you worry, she explains. Less than four years later, on a warm January afternoon in 2013, I bounced around the front seat of Butler's new Dodge pickup as he told the story of how his difficult days had come to an end and a new life had begun. Pointing to his rolling acreage like a proud parent, Butler described how one day just over two years earlier a representative of Conoco Phillips had come knocking on his office door to ask if the huge oil company could drill on his property. It turned out that a type of rock called shale was buried more than a mile below its surface. The rock was soaked with oil that suddenly had become accessible. Almost overnight, Butler's land was transformed into some of the most valuable acreage in the world. Butler parked his truck outside a Mexican restaurant in Nixon, Texas, population twenty-four hundred, and turned to me with piercing blue eyes. Its goddamn unbelievable what's happened to me in the last two years, he said, a smile of relief forming on his rugged face. I have to reach out and pinch myself, it's too good to be true. I was a business reporter from New York on a visit to South Texas in search of a story. My crisp blue Yankees cap seemed to clash with Butler's scuffed cowboy hat, and his honeyed Texas twang sometimes sounded like an entirely new language. I had spent a career at the Wall Street Journal writing about men and women who traded stocks and bonds, not livestock. Before I began my research, frack was the kind of word I'd caution my kids to avoid. At that moment, though, I was sure my Marlboro Man's tale, and the stories of others I had heard in places like Williston, North Dakota, New Milford, Pennsylvania, and Lexington, Oklahoma, were among the most compelling a writer could hope to find. Buck Butler and others at the heart of one of the greatest energy revolutions in history had experienced astonishing and unexpected change thanks to American oil and gas discoveries deemed unthinkable just a few years ago. The nation itself had been transformed, as had the world. The more work I put into the topic, the clearer it became that a burst of drilling in shale and other long-overlooked rock formations had created the biggest phenomenon to hit the business world since the housing and technology booms. In some ways, the impact of the energy bonanza might be more dramatic than the previous expansions, especially if shale drilling catches on around the globe. Surging oil and gas production likely will affect governments, companies, and individuals in remarkable ways for decades to come. Consider the following: As recently as 2006, business and government leaders fretted that America was running out of energy. By 2013, however, the United States was producing seven and a half million barrels of crude oil each day, up from five million in 2005. The country enjoyed its largest production increase in history in 2012 and could pump more than eleven million barrels a day by 2020, its highest figure ever and more than even Saudi Arabia currently produces. So much oil is flowing that in a few more years, the United States may not need to import any crude, or might only rely on friends such

as Canada and Mexico, ending a fifty-year addiction to oil from countries with interests that many years ago diverged from ours. In 2013, Saudi Arabia's billionaire prince Alwaleed bin Talal said the kingdom's oil-dependent economy had become vulnerable to rising U.S. energy production, a shocking turnaround from a few years ago when America seemed hopelessly dependent on Middle Eastern oil. America already is the world's largest producer of natural gas, thanks to shale drilling, and the country sits on two of the world's largest gas fields. Gas production has soared 20 percent in five years, and the United States now should have enough gas to last generations. Soon, the nation will begin exporting gas, an unimaginable possibility just a few years ago when energy supplies looked set to run out and the construction of gas importing facilities was considered a matter of national urgency. Rising production from dense rock has sent natural gas prices tumbling 75 percent since 2008. Because gas is used to heat and cool homes, produce electricity, grow food, power some vehicles, and make plastic, steel, and other products, the American gusher has been a boon to consumers and businesses, many of whom are still suffering from the worst economic downturn since the Great Depression. Meanwhile, growing U.S. oil production has allowed the country to enforce a boycott of crude from Iran at relatively little cost, and it could help keep a lid on global prices for years to come. The energy boom could generate more than two million new jobs by 2020, offsetting the jobs lost in the housing markets collapse. Hiring is on the rise in Texas, Oklahoma, and Louisiana, as well as in Ohio, Wyoming, West Virginia, and Pennsylvania, a shot in the arm for many long-struggling regions. North Dakota enjoys an unemployment rate of about 3 percent, a Walmart in the heart of the state's oil region pays employees twenty-two dollars an hour, and some local McDonalds outlets have resorted to offering bonuses of \$300 and thirty-two-inch flat-screen televisions to lure new employees.<sup>1</sup> Electricity and natural gas prices are so much cheaper in the United States than in most other countries that they could help usher in a new era of American economic dominance. A reshoring trend already is under way, as steel, chemical, fertilizer, plastics, tire, and other companies move production back to the country or expand existing factories, while foreign firms build new plants in the United States. The shift is helping to bring back some jobs once believed to have been lost forever to China and other low-cost economies. Some even see a manufacturing rebound in the making as made in the USA again becomes *de rigueur*. All the newfound oil and gas, along with expected energy exports, are slashing the nation's trade deficit and could boost the value of the U.S. dollar. The explosion of oil also has defense specialists debating whether the United States may be able to avoid certain future military actions aimed at securing energy supplies, allowing the country to trim its bloated defense budget and perhaps cede some security responsibilities to other countries, like China, that remain dependent on Middle East oil production. China, Russia, Argentina, and Mexico are among the countries with their own deep pockets of shale that may be tapped in the years ahead, while government officials in the United Kingdom and elsewhere have urged their countries to embrace shale drilling. In fact, global gas production could rise by 50 percent by 2035, some analysts say, helping consumers and businesses around the world. But troubling questions have been raised about the environmental consequences of some of the production methods responsible for soaring oil and gas supplies, including hydraulic fracturing, or fracking. Some worry about their impact on air and water quality, while others are concerned that fracking may contribute to climate change or lead to tremors and other disturbances. Hollywood starlets, rock stars, and media moguls, including Yoko Ono, Sean Lennon, Alec Baldwin, Paul McCartney, and Scarlett Johansson, have become activists on the hot-button issue, which figures to dominate headlines for years to come. The Rolling Stones even wrote a song, *Doom and Gloom*, that disparages fracking. Many of the environmental threats can be addressed or are overstated. But progress has been too slow, there have been damaging mishaps, and some say there's too little regulation. While soaring natural gas production actually might help alleviate global warming by reducing demand for dirtier coal in places like China, the resurgence of fossil fuels threatens to sap interest in still cleaner alternative energy sources. The full impact of the new drilling may take years to be fully understood, and some companies continue to resist sharing full details of how they fracture rock to get all that oil and gas, adding to the unease. \* \* \* The shifts that have taken place in the United States, and those on the way around the globe, are in many ways not nearly as astonishing as the story of how a small group of individuals made it all happen, against all odds. These modern-day wildcatters ignored the skepticism and derision of experts, major oil companies, and even colleagues to drill in rock they believed was packed with oil and gas miles beneath the earth's surface. These men have altered the economic, environmental, and geopolitical course of the world while scoring some of the swiftest windfalls in history. George Mitchell, who discovered a novel way to extract gas from shale formations, pocketed more than \$2 billion. His impact eventually might even approach that of Henry Ford

and Alexander Graham Bell. Aubrey McClendon and Tom Ward turned \$50,000 into one of the nations largest natural gas producers, one that would control the mineral rights to fifteen million acres, around three times the area of New Jersey. Mark Papa built a \$43 billion oil power from the discards of the disgraced Enron Corporation. Another pioneer, Harold Hamm, amassed a fortune of more than \$17 billion, making him one of Americas richest individuals. Hamm, who owns more oil in the ground than any American, has more wealth than Rupert Murdoch, Steven Cohen, Sumner Redstone, or even the estate of Steve Jobs. Hamms ongoing divorce likely will set a record for the costliest in history and could leave his wife with more money than Oprah Winfrey. Even Hamms right-hand man is worth as much as \$400 million, a sign of the outsized profits racked up by innovators of the age. Some of the architects of the shale gale were upended by a revolution they themselves helped create, however. They would see fortunes slip through their fingers and experience ridicule and scorn rather than wealth and admiration. And if the worst fears about the drilling are borne out, those at the forefront of the movement will be remembered for the damage they wrought rather than the blessings they bestowed. But how did a few unlikely, ambitious, and headstrong wildcatters some without college degrees or much background in geology or drilling manage to tap massive energy deposits dismissed by the largest energy powers? ExxonMobils corporate headquarters are directly above a huge shale formation, but the oil giant disregarded the area, even as George Mitchell worked on coaxing historic amounts of gas from rock in the region. Why did a new age of energy emerge from the depths of the Great Recession, even as Federal Reserve chairman Alan Greenspan warned of dwindling U.S. supplies, investors Warren Buffett and Henry Kravis bet on a dearth of natural gas, and Vladimir Putin predicted a Russian gas monopoly? Why did private enterprise revitalize the nations energy outlook with a focus on fossil fuels, of all things, even as governments funneled \$2 trillion toward cleaner, alternative energy? How did obscure energy entrepreneurs develop technologies to produce a surge of energy, even as a chorus of experts, including Peter Thiel, an original investor in Facebook, derided the country for no longer making dramatic technological advances? And why did it all happen in the United States and not in China, Russia, or other countries that boast their own enormous deposits of oil and gas in similar rock? This book, based on over three hundred hours of interviews with more than fifty of the key players of the era, attempts to answer these questions. It also anticipates how the new age of energy might influence global financial markets, economies, military activities, and international politics. Government experts charged with developing energy policy were caught flat-footed by the dramatic recent shifts, as were environmental specialists and top oil-and-gas executives, suggesting that there is much to learn from those who managed to lead the shale revolution. Those responsible for the remarkable period skirted danger every step of the way, risking their reputations and livelihoods for the discoveries of a century. Their saga unfolded in barren fields, in cluttered pickup trucks, and in high-pressure boardrooms. Its one that will continue to impact the world for years to come.

**PROLOGUE**

The phone call came as a jolt. It was May 2007 and Harold Hamm was enjoying dinner at the elegant Brown Palace Hotel and Spa in downtown Denver. To Hamms right were two longtime colleagues from his energy company, Continental Resources. A pair of Merrill Lynch investment bankers sat to Hamms left. The group was two-thirds through a grueling ten-day coast-to-coast trip aimed at wooing investors ahead of a crucial initial public offering of shares of Continental. When rock bands go on road trips, the days are slow and the nights furious; when executives take to the road to sell pieces of their companies, the opposite usually is true. Hamm and the bankers had spent a full day convincing mutual fund honchos that Continental was set to strike it big in North Dakota, a long-overlooked part of the country. Now the group relaxed over dinner and drinks, their jackets off and ties loosened, as they discussed ways to improve their pitch. As hed courted the investors, Hamm hadnt dwelled on the personal challenges he had overcome, such as growing up dirt poor in rural Lexington, Oklahoma, the youngest of thirteen children. Hed also avoided mention of his more recent turbulent love life. Instead, Hamm shared an upbeat message about his company and a promising 15,000-square-mile formation of rocks called the Bakken under parts of North Dakota, Montana, and Canada. Hamm believed he was at the vanguard of a revolution that would deliver new oil and gas supplies to a nation running out of energy. For all his big talk, though, Continental was producing just seven thousand barrels of oil a day from the Bakkens dense rock. It was a mere trickle, representing a fraction of 1 percent of what ExxonMobil pumped on a daily basis. The results offered little proof that much more would flow from a region that had frustrated wildcatters for years, making Hamms pitch to investors challenging. Still, the trip appeared to be on track, and the final leg meetings with investors in Los Angeles was just days away. The Merrill Lynch bankers told Hamm there seemed to be enough interest in Continental for the company to sell its shares for as much as eighteen dollars each in its

prospective offering. With the IPO just a few weeks away, Hamm, a sixty-one-year-old with thinning auburn hair, a full stomach, and a playful grin, was in good spirits as the dinner wound down. A lot was riding on the offering. Continental already owed \$253 million to lenders, and Hamm planned to use some of the IPOs proceeds to pay down a portion of that debt. He knew his company would have to raise hundreds of millions of additional dollars at some point to tap the vast quantities of oil he suspected were buried in the Bakken layers of rock. Being public was the only way his company could raise enough cash at reasonable rates to find all that oil. We had to be public to be a major player in the Bakken, Hamm recalls. But at that point we had very little product. Outside the hotel, gloom was setting in. The real estate market was on its last legs, financial firms were wobbling, and the global economy soon would experience its worst downturn in eighty years. Technology and management gurus said America had lost its creative spirit and the country's economic dominance seemed doomed. Many economists predicted a passing of the baton to India, Brazil, and China. Energy producers were coming up dry, leading to hand-wringing on Wall Street and in Washington, D.C., about how the United States would meet its future energy needs. As Hamm looked around the table, though, he was convinced he was close to realizing his life's dream, one that would help confer extraordinary blessings on the nation just when it needed them most. Most executives his age were negotiating retirement packages and scouting golf courses. In a sense, though, Hamm's real life's work was just beginning. He was sure a historic gusher was in the offing that would reenergize the entire country. Just then, one of the Merrill Lynch bankers, Christopher Mize, heard his cell phone ring. Hamm watched as Mize picked it up. Wow . . . that's a surprise . . . okay . . . thanks. Hamm sensed something was wrong. It's not good, Mize told him. Two competitors in North Dakota had just reported results from their own exploration efforts in the Bakken rock layer. They were big-time disappointments, suggesting that Continental also would come up dry in the area. They busted their pick, one of the bankers told Hamm, using industry lingo for a huge strikeout. We can pull the plug on the IPO or keep it going and try to make it happen, though it will be more of a challenge, the bankers told Hamm. It's up to you, Harold. Think it through carefully. Hamm barely uttered a good night and went straight to his room, shaken by the news. The next morning, Hamm told his team they'd continue to pursue the IPO, even if it meant lowering the price to try to entice investors. They might not appreciate what Continental was working on, but Hamm was sure they'd catch on. Behind Hamm's confidence was an understanding of the dramatic advances a few American companies like his own were achieving in the way they drilled and extracted oil and gas, breakthroughs that Wall Street investors, industry experts, and even the largest oil companies didn't fully appreciate. For decades, prospectors had fractured, or broken up, rock formations by pummeling them with various liquids, creating pathways for natural gas to flow to the surface. The process was called hydraulic fracturing, or fracking. But Hamm, along with other adventurous wildcatters around the country, had begun to combine improved fracking techniques with cutting-edge methods of drilling sideways deep in the ground. They were targeting long, wide rock layers thick with oil and gas. These were formations of shale and other rock that geologists once only dreamed of accessing. Hamm was receiving daily updates detailing how his crew was boring ten thousand feet into the ground, turning drill bits to go another two miles horizontally, and locating layers of rock brimming with oil. One of Hamm's men boasted he now could hit a target miles below the surface that was no larger than a tiepin. Hamm was determined to use this new technology to change the direction of his company and even his country. He just needed to get investors on board. Several weeks later, Continental sold its stock at a reduced price of fifteen dollars a share. Wall Street is accustomed to IPOs that soar on takeoff. This one barely fluttered. For months, the stock did little, falling below fifteen dollars in early September 2007. One of Hamm's key staff members sold all his shares even he worried the company wouldn't amount to much. Hamm still believed an abundance of oil lay untapped in overlooked areas of America, and that his company was getting closer to finding it. Few agreed with him, however. Don't they get what's happening? Hamm thought. \* \* \* There was good reason for deep skepticism about Harold Hamm and his quest to unlock huge amounts of oil in North Dakota. Hamm was a genial dreamer, maybe even past his prime, not unlike his nation. The oil industry got its start in the United States and the country spent over a century as the world's energy giant. At one time, American oil-and-gas supplies seemed endless. But during the 1970s, promising fields became more difficult to locate. American oil production peaked in 1970 at 9.6 million barrels a day, and imports began to soar as the country scrambled to get enough crude to meet its growing demand. The 1973 Arab oil embargo served notice that the nation had become reliant on others for its energy needs. Those others usually weren't our best friends, either. Oil magnates J. R. Ewing on Dallas and Blake Carrington on Dynasty may have seduced television audiences in the 1970s and 1980s, but real-

life drillers were finding it tough to regain their swagger amid a string of dry holes. A global glut of oil during the 1980s and 1990s resulted in weak prices good news for consumers but bad news for American wildcatters, who found it difficult to keep up with foreign rivals. Power brokers in energy capitals such as Dallas, Houston, and Tulsa ignored what Hamm was up to in North Dakota. Instead, it was Aubrey McClendon an Oklahoma upstart employing his own improved fracking and drilling techniques who was gaining admiration and even envy. In late spring of 2008, McClendon became a multibillionaire, as shares of his new energy power, Chesapeake Energy, soared. He also helped bring a pro basketball team to Oklahoma City, electrifying the state. Later, when McClendon sat courtside at games with his relative, Sports Illustrated swimsuit cover model Kate Upton, the jealousy and buzz grew. Hamm owned his own front-row seat close by. Few noticed him, though. Talk in the energy patch, in Washington, and on Wall Street in early 2008 was of peak oil, a popular and vaguely Malthusian notion that the growth of global energy supplies had reached its limit, a dreaded shift sure to lead to rising prices and global economic strains. McClendon's company was among the few still making huge new discoveries by focusing its drilling on shale, a dense rock long ignored by oil giants. In March 2008, McClendon hosted a dinner at New York's upscale 21 Club for a group of Wall Street billionaires and others hoping to understand the new energy world. Investors George Soros and Stanley Druckenmiller were there. So were some of the leading minds of the global energy business. Over dinner, McClendon's guests agreed that an era of oil and gas scarcity, and rising prices, had begun. As he watched the conversation unfold from the head of the table, McClendon couldn't hide a confident smile. His company was extracting growing quantities of natural gas, despite the pessimism around the room. McClendon had plans to pump even more of it, giving him a chance to become a modern-day Getty or Rockefeller. Far from that New York hot spot, however, a revolution was quietly under way, one that star investors, politicians, energy experts, and most oil executives were oblivious to. It had started a decade earlier in Texas when a wildcatter named George Mitchell searched for a way to keep his business alive. Soon Hamm, McClendon, and other once obscure drillers would unleash a dramatic transformation of the nation and the world. That evening in New York, though, few at the table had any idea what was ahead. It never occurred to any of us what was about to happen, says Druckenmiller.

CHAPTER ONE  
The meek shall inherit the earth, but not its mineral rights.  
J. Paul Getty  
George Mitchell wasn't out to change history. He just wanted to keep his company going. It was the summer of 1998 and Mitchell Energy was sending huge amounts of natural gas each day from its Texas fields to a pipeline serving the city of Chicago. For decades, the arrangement had provided the company with steady profits, helping Mitchell become wealthy. But his gas reserves were depleting, slowly but surely. Mitchell Energy's shares were falling, the industry was on its back, and time was running out for both the seventy-nine-year-old executive and his business. A slow, inevitable decline seemed certain, one that Mitchell was desperate to avoid. He convened a meeting of his top executives in a large conference room at the company's headquarters outside Houston. They had been searching for new sources of natural gas for nearly two decades, a fruitless quest that left some of the management team frustrated. Mitchell was convinced their best bet was to try to unlock gas deposits from shale, a dense type of rock deep below Mitchell Energy's acreage in North Texas. They had spent years drilling this rock, however, and it still wasn't working. Larger rivals, such as Exxon, Royal Dutch Shell, and Chevron, already had shuttered operations trying to tap oil and gas from similar rock formations around the country. These huge companies headed off to drill in Africa, Asia, Brazil, and offshore locations. Almost any spot outside the United States appeared more promising than Mitchell's Texas shale. The United States was running on empty, just like Mitchell Energy. A growing dependence on foreign energy had pressured the country into costly foreign entanglements at least partly aimed at safeguarding sources of oil and gas, such as the invasion of Iraq seven years earlier after that country annexed Kuwait, a Gulf oil power. The United States would have to get used to a deeper reliance on foreign energy and additional military campaigns, it seemed, as Russia and other nations with vast energy resources assumed greater power. As the 1998 meeting got under way, Mitchell's heir apparent, Bill Stevens, spoke up forcefully. The company was wasting its time, Stevens said. Even if they somehow could get a lot more gas to flow from this challenging rock, production costs likely would be too high to make much of it worthwhile. Drilling in the Texas shale wasn't worth the expense of leasing new acreage in the area, Stevens argued to Mitchell and the rest of the company's board of directors. Mitchell had been getting the same message from his son Todd, an experienced geologist who was on the company's board. Shale drilling might be huge someday, Todd had said, but the company was spending too much on additional wells. Todd repeated his view over lunch, at family occasions, and in private meetings with his father. The company was piling on a frightening amount of debt,

Todd warned, and George Mitchells personal debts were at worrisome levels. It seemed clear that George Mitchell was jeopardizing his companys future with his stubborn pursuit of shale drilling. Mitchell listened patiently to the skepticism at the board meeting. He said little in response, though, ending the meeting abruptly, leaving board members frustrated. Later, Mitchell reached out to his geologists and engineers working on the Texas shale project. He told them he was sure theyd eventually find a way to get substantial amounts of gas from the shale. Keep going, its got to be there, he said, trying to boost their spirits. Privately,

Mitchell had his own growing worries. I thought perhaps they were right and it wouldnt work, he recalls. Mitchell couldnt share his concerns with any of his top executives, though, let alone discuss them with his team working in the field. This was Mitchells last shot. He had to give it a full try. I had no choice, really, Mitchell recalls. We had to get the gas to flow. Running out of gas was a huge problem for George Mitchell and his company. He and his family of immigrants already had overcome a series of imposing obstacles, however. It gave him some hope he might succeed in the final quest of his life. \* \* \* Mitchells father, Savvas Paraskevopoulos, was a goatherd in Nestani, a dusty mountain hamlet in southern Greece. In

1901, at the age of twenty, Paraskevopoulos, the fourth of five children, got a glimpse of his meager inheritance in the poor, rural country: a quarter acre of land nowhere near any water source. He quickly decided hed have to do something else with his life. Impoverished and illiterate, Paraskevopoulos walked fifty miles to a freighter bound for Ellis Island, agreeing to work on the ship in exchange for free passage,

becoming one of thousands of Greeks leaving for America. With no skills to speak of and virtually no English, Paraskevopoulos was grabbed by railroad laborers as he disembarked. Soon he was laying tracks with an Arkansas railroad gang working its way toward Texas. It was backbreaking work that helped lay the nations foundation. One day, the Irish paymaster of the gang, Mike Mitchell, approached Paraskevopoulos, looking annoyed. Mitchell said he was having too much trouble writing Paraskevopoulos long and ungainly name. He told the immigrant to change it. From now on, your name is the same as mine, the paymaster told Paraskevopoulos. With that, Savvas Paraskevopoulos became Mike Mitchell. He eventually made his way to Houston, joining a cousin who had a shoeshine parlor near a glamorous hotel in town. Soon the young Greek had saved enough money to start his own shoeshine and pressing shop across from the Buccaneer Hotel in Galveston, a city fifty miles away with a growing population of Greek immigrants. Flipping through a local

Greek-language weekly paper one morning, Mitchell saw an article about an attractive young woman, Katina Eleftheriou, on her way to Tampa, Florida, to live with her sister. Taken with her beauty, Mike Mitchell cut the article out and stuffed it in his jacket pocket. Two years later, after saving enough money to afford a train ride to Tampa, he put on a coat and tie and left to track Eleftheriou down. Mitchell didnt know a soul in Tampa, but he got in touch with someone from the Greek community and managed to locate the young woman, who by then was engaged to a local man. With charm and persistence, Mike Mitchell broke up the relationship and brought Eleftheriou, a fellow Peloponnesian, back to Galveston. They wed in 1905

and raised four children, the third of whom was George Phydias, born in 1919 and named for one of the greatest sculptors of classical Greece. The Mitchell family lived in a rough immigrant neighborhood that locals nicknamed the League of Nations, an area where bootlegging and gambling flourished. Money was tight, so George helped his family make ends meet by hunting for duck and dove and by fishing for speckled trout and redfish, which he sold to Gaidos, a historic Galveston fish restaurant, for twenty cents a

pound. Katina Mitchell, who never learned English, was a beacon for the local Greek community, hosting new immigrants at the Mitchell home for weeks at a time until her sudden death from a stroke at forty-four, when George was thirteen. Shortly thereafter, Mike suffered a badly shattered leg in an automobile accident. Georges older siblings, Christie and Johnny, were old enough to be on their own, but George and his sister Maria were sent to live with relatives. George Mitchell didnt speak English until he began grade school, but he managed to become a top student at well-regarded Ball High School in Galveston. He planned to fulfill

his mothers dream by attending Rice University and becoming a physician. But a math class taught by a dynamic teacher during his senior year, as well as a summer working in Louisianas oil fields with his older brother Johnny, helped change his mind. Making discoveries by looking at maps seemed exciting, says Mitchell, even though oil was only selling for about \$1.20 a barrel and the industry was going through tough times. Mitchell studied geology at Texas AM University and was the schools top-ranked tennis player, but he often found himself strapped for money and unable to pay tuition. To raise cash, he began reselling candy to fellow students on campus. Youd put a stand up and put up a sign saying, Drop your money in, and youd have twenty or thirty different candy bars, he says. It was kinda fun. Well, it was fun until members of the schools football team began grabbing Mitchells candy bars without paying for them, daring him to do

something about it. He realized he had to come up with a fresh moneymaking idea, so he began selling gold-embossed stationery to lovesick freshmen, making \$300 a month in his last year in school.<sup>2</sup> That year, a professor of petroleum engineering gave Mitchell advice that left an impression. If you want to go work for Humble Oil, fine, then you can drive around in a pretty good Chevrolet, the professor said, referring to a major energy producer at the time that later became part of Exxon. But if you want to drive around in a Cadillac, you'd better go out on your own someday. Mitchell earned a degree in petroleum engineering in 1940 and then worked on an Amoco oil rig in Louisiana's Cajun country. Then World War II broke out. Mitchell expected to see combat overseas, like many his age. He was wary, however, after mourning too many friends who had died abroad. Instead, he enlisted with the U.S. Army Corps of Engineers. Mitchell tried to convince his commanding officer that he was indispensable in the Houston area. He worked hard, played tennis with the colonel, and even dated his daughter, all to try to ensure that he wasn't shipped overseas. It worked. Mitchell spent almost five years managing hundreds of men and building projects in Houston and elsewhere. At the time, Mitchell was more focused on the opposite sex and on avoiding combat than on his future in the energy business. Less than two weeks before the attack on Pearl Harbor, on a train ride back to Houston after a Texas A&M football game, he spotted an attractive young woman, Cynthia Woods, and her twin sister, Pamela, on a double date with two students. Cynthia's date was intoxicated and she was growing miserable. The guy was drinking whiskey out of a flask and it made her angry, Mitchell recalls. Finally, Cynthia asked her sister's date to try to get rid of the jerk so she wouldn't have to deal with him any longer. The date found a poker game in another train car and convinced the rowdy young man to check it out. Mitchell quickly made his move, introducing himself to Cynthia and getting her phone number. Back home, George and Cynthia began dating and later would join Pamela and her date from that evening in a double wedding. After the war, George consulted on oil and gas drilling projects in Houston, earning a reputation in the area for picking productive wells. It was enough early success to convince him and his brother, Johnny, to try their luck as prospectors, or wildcatters, modern-day treasure hunters who risk financial ruin in hopes of discovering oil and gas. They would gamble it all to drill their own wells and George would try for that Cadillac, just as his professor had advised. The brothers didn't choose the most creative name for their company Oil Drilling, Inc. but the Mitchells, working with a third partner, opened for business in 1946 in downtown Houston's Esperson Building with high hopes. An early problem developed: George and Johnny couldn't afford the fees charged by local libraries to borrow well logs, the detailed records of geological formations that are crucial to finding oil and gas. To get out of their bind, George convinced a local firm to let him borrow the logs at the end of the day and return them by 8 a.m. the next morning, before they opened for business. George, the trained geologist, stayed up past 2 a.m. each night poring over the logs, trying to identify promising oil and gas prospects. After George located acreage that seemed attractive, Johnny, more outgoing and upbeat than his younger brother, would approach a group of oil and gas promoters congregated in the building's drugstore, a famous downtown gathering spot and breakfast joint, to try to raise enough cash so the Mitchell brothers could begin drilling some wells. Soon Johnny became friendly with some Jewish businessmen from Houston and Galveston, including grocery-store owners Abe and Bernard Weingarten, who were looking for ways to invest their spare money. The group agreed to pay the Mitchell brothers fifty dollars a month to discover drilling prospects for them. The brothers also received an ownership stake of about one thirty-second of each well they drilled for the investor group. After some early successes, other investors also began giving money to the Mitchell boys to search for oil and gas wells. We got a reputation for finding oil, so people found us, Mitchell says. All the top Jewish families were willing to risk money in oil and gas. The brothers accumulated an impressive track record, even as they competed with a rush of independent wildcatters flocking to Texas after World War II. The investor group was making money, but they still could be hard on George and Johnny, threatening to withdraw their support if the Mitchell brothers hit too many dry holes in a row. Once, when George Mitchell told Will Zinn, a Galveston lawyer, that they'd found salt water, not oil, in a key well, Zinn shot back, Hey, I've got all the salt water I need in Galveston. . . . I don't need to spend all my money to get any more of it.<sup>3</sup> If we did over five dry holes in a row they would leave us, Mitchell recalls. To avoid that scenario, Mitchell made sure to always retain one especially promising well in reserve, to drill if he ever hit a losing streak, a move that kept the investors from bailing. Soon cash was coming their way from all over the country. One backer was Galveston gambling magnate and organized crime boss Sam Maceo. Another was Barbara Hutton, the troubled and famous heiress to the Woolworth retailing fortune who also was the daughter of a founder of the brokerage firm E. F. Hutton. (Hutton made headlines for marrying seven men in her lifetime,

including actor Cary Grant. She profited from Mitchells drilling successes but died almost penniless, having squandered her wealth on alcohol, drugs, and a string of playboys.) Another satisfied investor was Robert E. Smith, a well-known independent energy producer and real estate investor in Houston. In his youth, Smith was turned down by an army recruiting officer who noticed he was missing two fingers on his right hand, the result of a hunting accident. I've still got my trigger finger and you can pick out the toughest guy in this bunch and Ill bust his butt for you, Smith told the officer, who quickly signed him up.<sup>4</sup> After the army, Smith was fired twice by major oil companies for punching coworkers. With only a high school education, the young man set out to become a wildcatter, enjoying huge success drilling his own wells in the region. Later, he would help bring the Astros baseball team to Houston. Smith agreed to take a 25 percent stake in some Mitchell wells, easing financial pressures that had built on the brothers, though adding other kinds of stress they hadnt counted on. Smith would call up and raise hell about this or that, Mitchell says, but he was a good investor. George and Johnny Mitchell began claiming larger ownership stakes in their wells as they drilled in various spots in Texas, Louisiana, and New Mexico. Their companys name may have referenced oil, but the Mitchells usually hunted for natural gas, the poor stepchild of oil in the energy family. Natural gas is a light hydrocarbon that comes from the compressed remains of plants and animals. It can be converted into liquid form by lowering its temperature, making it a bit more useful, but until the second half of the twentieth century it was generally dismissed as a useless by-product of crude oil, which is more easily stored and transported. Oil, by contrast, is composed of heavier hydrocarbons that form as liquids. Its liquid form makes oil ideal for a range of uses, such as powering cars, jet engines, and other forms of transportation. Thats a key reason why oil became more popular than natural gas, which had its own uses, such as cooking and heating some homes. At the time, during the early 1950s, natural gas was only selling for about seven cents per thousand cubic feet, a price so low that most large energy companies ignored gas or burned it off as waste if they captured it while drilling for oil. Vast interstate transmission systems hadnt yet been built to easily ship gas to homes, power plants, or businesses, keeping a lid on demand. The Mitchells found they could score profits by keeping their costs low, though, and they bet that the market for gas might grow as the countrys petrochemical industry expanded. Just as important, rivals were busy looking for oil, so the Mitchells faced limited competition. The majors didnt care about gas, they just wanted oil, George Mitchell says. Johnny Mitchell good-looking, well dressed, and flamboyant dealt with the companys investors as he drove a maroon 1946 Ford around Houston. He sometimes walked around the city in jungle shorts and a safari helmet, according to a news report at the time. Later he would write a wartime potboiler called *The Secret War of Captain Johnny Mitchell: The Lusty Wartime Reminiscences of One of Texass Most Colorful Oilmen*. (Much of the book describes Johnnys wartime sexual conquests in prose that can be a bit awkward. A sample passage: Iceland wasnt barren of good-looking girls; in fact, some were extremely beautiful. They wore wool dresses, which were imported from Britain in exchange for fish.) Johnny was a promoter, he was a positive guy who could really sell a deal, recalls T. Boone Pickens, who started his own energy investing and drilling career in Texas in the 1950s. George Mitchell, tall, balding, and more introspective and intense than his brother, continued to focus on finding and drilling gas wells. Married and already a parent, he lived in a modest home, employees recall. He kept an eye on the companys expenses, as well as his own, though he sometimes drove an older, pink Cadillac, just as his college professor had anticipated. The brothers distinct personalities sometimes led to conflict. George, wearing a suit with a torn pocket, once walked into a colleagues office, interrupting a meeting he was having with Johnny. George, you look like crap, Johnny told his brother. Why dont you buy a new suit and some new clothes? If youd pay me some of the money you owe me, I might be able to afford some new clothes, George shot back. One day in 1952, a bookie in Chicago shared a tip with another of George Mitchells investors, Louis Pulaski, about a natural gas field in north-central Texas, near Fort Worth. The bookie didnt know much when it came to energy; he usually just took horse bets for Pulaski, the owner of a Houston junkyard. But the out-of-town bookie told Pulaski that he had spoken with contacts in the drilling business and had a hunch that a 3,000-acre spot under the Hughes Ranch in Wise County would be a winner. Figuring the bookie might have a hot tip, Pulaski called George Mitchell right away, urging him to look into the field. Mitchell was skeptical, and not just because the tip had come from a horse bookie eight hundred miles away. The acreage the bookie and Pulaski were excited about had already been picked over by locals. It even had acquired a damning nickname among veterans in the business: *The Wildcatters Graveyard*. I dont know, General, that field has been passed around for years, Mitchell told Pulaski, whom he referred to as the General after famed general Casimir Pulaski, the soldier of fortune who saved George Washingtons life in the American Revolutionary War. It doesnt have much of a

chance, Mitchell told him. Pulaski persisted, though, and Mitchell agreed to check the field out. He got some help from a drilling contractor he had met in college, Ellison Miles, as well as another geologist who had studied the region. After some testing, Mitchell turned more enthusiastic and decided to try drilling the area. The first well was a winner. So was the next one and the next seven, too. Mitchell had hit a stratigraphic trap, a huge underground reservoir of natural gas. The bookie was on to something after all. To take advantage of the find, Mitchell and his company acquired 300,000 acres in the area in just ninety days. They paid three dollars an acre and kept buying land until they and their investors ran out of money. Large oil companies, or majors, as they are known in the energy business, dismissed the acreage as worthless because it contained natural gas, not oil. But Mitchell was convinced he could tap profits. Some big markets such as the Chicago region, were seeing growing demand for gas. Sure, prices for natural gas were low less than ten cents per thousand cubic feet, or the equivalent of about seventy cents in 2013's money but Mitchell thought they were high enough for his company to make money. \* \* \* The Mitchell team would drill various rock layers in Wise County, including conglomerate sediment that was considered very tight, or compressed. In other words, the pores of these rocks were so mashed together that it was hard to get gas to flow from it. The rock had such low permeability that it provided another reason for major oil companies to avoid the area. But George Mitchell was willing to try a relatively new drilling technique he had read about in petroleum-engineering literature that held the possibility of loosening up this compact rock and getting the gas to flow. The technique, a way of completing oil and gas wells, or preparing them to produce energy, was called hydraulic fracturing, or fracking. It entailed fracturing the rocks, or breaking them up, by pummeling them with various liquids to free up the gas trapped in those rocks. (Years later, hydraulic fracturing became known in the popular media as fracking, with a k replacing the c. From the beginning, industry members detested the word because of its closeness to the common expletive, not to mention a similarity to fragging, the act of attacking fellow soldiers. Fracking also rhymes with hacking, yet another word with a negative connotation. Energy veterans claim that fracking was coined by those with a bias against the industry. In truth, the word was first used in the late 1970s in the science fiction series *Battlestar Galactica* as a substitute for the curse word.) The idea of violently fracturing rock to extract oil or gas traces back to an invention in the 1860s by Edward A. L. Roberts, who fought in the Civil War battle of Fredericksburg as a lieutenant colonel for the Union. During the heat of battle, Roberts noticed that when mortar shells fell into a narrow canal, a column of water shot up, sky high. It gave him an idea. Until then, drillers had relied on black-powder explosives to coax oil out of stubborn wells, a method that often proved frustrating. John Wilkes Booth and some of his business partners once destroyed their company's Pennsylvania oil well while using black powder to try to speed the well's production. Booth eventually gave up on the oil business and grew angry about the South's defeat in the Civil War. Days after General Robert E. Lee surrendered, Booth shot and killed President Abraham Lincoln. After returning home from the war, Roberts developed a torpedo mechanism that lowered explosive nitroglycerine capsules into wells. These capsules managed to direct an explosion sideways, instead of out of the hole. That fractured oil strata around the hole much more effectively than previous attempts. The result: More oil could be extracted. Roberts's invention was embraced by a U.S. oil industry that had begun just a decade earlier, in 1859, with the discovery of petroleum in Titusville, Pennsylvania. Drillers paid Roberts as much as \$200 each time they used his torpedo mechanism, plus one-fifteenth of the value of the increased flow of oil they experienced. The fee was so high that a black market quickly emerged involving workers willing to employ Roberts's torpedo technique using the cover of night. Their secretive, explosive oil drilling under the stars was called moonlighting, a term that soon became popular in the American lexicon. By the 1930s, men working on rigs experimented with guns and ammunition, as some men are wont to do. An underground machine gun six feet tall became a popular way to open holes in casing and unlock oil. Swiss engineer Henry Mohaupt's bazooka projectile, invented as part of a secret U.S. Army program, also became a popular way to get oil flowing when it made its way to oil fields in the 1950s. The United States and the Soviet Union actually detonated nuclear devices to try to get oil and gas flowing in tight rock, though it wasn't a method that caught on, for pretty obvious reasons. The former Standard Oil of Indiana (which later became Amoco) had first used high-pressure liquid to break up underground rock formations in Grant County, Kansas, in 1947. Some say the technique may even have been employed a bit earlier. In the early 1950s, as George Mitchell focused on the compressed rock in Wise County, Texas, many rivals resisted fracking. It wasn't because there was any controversy attached to it. At the time it hadn't really occurred to Mitchell or many others that this activity might have any kind of environmental risks. Companies avoided fracking because it was expensive and added time to a drilling

project. They preferred the traditional method of looking for hydrocarbons: Drill a well, like a straw into the ground, and try to hit pools of trapped oil or gas capable of flowing to the surface without the artificial stimulation of hydraulic fracturing. After decades of low gas prices, companies were struggling to keep costs down, not increase spending on hydraulic fracturing. But Mitchell didn't have much to lose, so he gave fracking a try, hoping to make the Texas fields yield oil or natural gas. Mitchell saw that fracking seemed to do a good job stimulating reservoirs that needed a little help to get going, a bit like giving the back of an old television a little bang. His company's efforts worked, and by the late 1950s the Wise County field had become their most important source of natural gas. George Mitchell wasn't the nation's first fracker. Mitchell was mighty early, though. The majors didn't bother with fracking, they didn't want to fool with it, he says. I saw it as the new technology. Over time, George Mitchell assumed greater control over the company, as Johnny focused on other interests. Soon Mitchell went on an acquisition binge, confident that gas prices would rise. But gas prices remained low and the company was often strapped for cash, forcing it to hold off drilling for long stretches. Those delays sometimes grated on homeowners who had leased Mitchell land and expected regular royalty checks. After a number of leaseholders voiced their displeasure in 1956, Mitchell decided to deal with the unhappiness publicly. He invited the entire county to a barbecue and told three thousand residents that he was prepared to spend millions to drill. They just had to be a bit more patient. Most came away from the barbecue satisfied with the promise.<sup>5</sup> An energy price decline in 1957 brought new stress, though. Mitchell Energy also fought with a rival and had difficulties shipping gas out of the area. The company's spending grew nonetheless, unnerving B. F. Budd Clark, a senior executive who was a native of New York City and a graduate of Harvard Business School. Pressure built within the executive ranks. The Mitchell staff didn't come to collective decisions so much as fight their way to them. There was screaming in the offices, in the halls, and pretty much everywhere. It got so bad that Joyce Gay, who began as a secretary and eventually worked in public relations for the company, had to affix soundproof taping around the doors outside Mitchell's office so outsiders couldn't hear all the yelling. George and Budd would scream in the hall until Budd had arrived at the four-letter word and then George would yank them all back in the office and shut the door, Gay recalls. They used to joke and say it was management by decibel. . . . It was just their style, they'd scream and yell. In the middle of an important meeting one day, one of the company's lead attorneys at the big Houston firm Vinson Elkins fled Mitchell's office, joining Gay in her nearby office, she recalls. I'm not going back in until they quit yelling, he told her. It took about ten minutes before Mitchell and the other executives realized their lawyer had left, Gay recalls. A way out of the jam was found in a pipeline being built by the Natural Gas Pipeline Company of America to take gas from North Texas through Oklahoma to the Texas Panhandle, where it would be transported to Chicago. The company agreed to a twenty-year contract to buy natural gas from George Mitchell's company at thirteen cents per thousand cubic feet, a price slightly above the market price. (The deal would be renewed in 1977.) The contract was a lifeline for Mitchell Energy, which over many years supplied 10 percent of Chicago's natural gas needs. Mitchell's company continued to refine its fracking techniques, succeeding in bigger fields and benefiting from a program financed by the Department of Energy that split the costs of some expensive frack jobs, with each chipping in \$1 million. Over the years, George Mitchell bought out almost all his minority partners. Many were eager to sell, worried about the company's heavy debt load and cash flow issues. The strain affected Howard Kiatta, a Mitchell geologist, when he tried to buy a map one day in the 1960s. Just send me the invoice and we'll pay it, Kiatta told the salesperson. No, you work for George Mitchell Associates. You send us the check first; if the check clears, then we'll send you the map. Why? Because he doesn't pay his bills. Mitchell felt the need to become involved in even the smallest decisions of the company, exasperating some employees. Jack Yovanovich, a senior vice president in Mitchell Energy's land acquisition area, recalls it this way: George would come around almost three or four times a week, sometimes twice a day, and always tried to control every bit of leasing. Now you think about this: You're leasing lots that are less than, well, some of them, around one-tenth of an acre, some of them two-tenths, and George is coming around wanting to know what you're doing here and how you're doing it, why you're doing this and why you're doing that, and he was driving me and my guys crazy. One day, Yovanovich told his boss, Look, George, you've got to leave us alone. Mitchell agreed, after Yovanovich said he'd provide him with a weekly written report detailing what they were doing. The company went public in 1972, providing the much-needed infusion of cash for newly named Mitchell Energy Development, and George Mitchell was able to keep 70 percent of the voting stock. The 1973 Arab oil embargo sent energy prices flying and Mitchell's shares also climbed. By the late 1970s, Mitchell had turned more relaxed and there was a bit less yelling and screaming. The period

proved a fruitful time for the natural gas industry, with prices spiking and revenue increases following.\*By now, George Mitchell had ten children, a brood that became a matter of fascination and humor at his company. When Shaker Khayatt, a Mitchell Energy director, sat in Mitchells office one day, he noticed ten different childrens photos on the wall. George, thats very interesting. I never thought of taking pictures of my children at different ages, Khayatt said. What are you talking about? Well, you have them young here and then about five years later. Wake up, theyre all different, he told Khayatt.<sup>6</sup>The growing family sometimes presented challenges for Mitchell. When the family traveled together, even on short trips, the children would count off so that one wouldnt be left behind in the confusion, he recalls. Mitchell, an Episcopalian, later confided that although he loved his kids, his wife, a devout Catholic, was the one spurring the familys growth. After having three daughters and one son, my wife kept saying she wanted one more girl, he says. Instead, Cynthia Mitchell had six more boys. Finally, we gave up, he says. As Mitchell loosened up, his employees developed a deep respect for him, partly due to the enthusiasm he brought to the job. At the companys headquarters, he roamed the halls, popping into various colleagues offices, asking what employees were working on and how he could help. With gas prices higher, he was in a better mood, and his employees came to enjoy his surprise appearances in their offices. Mitchell favored checkered pants and jackets that reminded some of the attire of a used-car salesman. He managed his company with an informality and dedication that inspired employees. George avoided all publicity, says Clark, the senior executive. He was just work, tennis, work, tennis, work, tennis.<sup>7</sup>Mitchell evolved into an unusual energy baron. A few years earlier, he had met R. Buckminster Fuller, a futurist and an early environmental activist. Fuller believed human sustainability was in jeopardy and that societies needed to turn to renewable energy sources, including solar and wind power. Mitchell became convinced of the need to pursue alternative energy options in addition to fossil fuels. It took me three or four days to understand what he was talking about, recalls Mitchell, who hosted Fuller at various conferences. He made me believe we were really going to have trouble keeping up with society. By the 1970s, Mitchell was reading the work of Dennis Meadows, a scientist who recommended ways to slow global growth to reduce the impact a growing population was having on finite resources. He also became an advocate for sustainable energy technologies and food sources. Focused on preventing urban decay from taking place in Houston and elsewhere, Mitchell visited troubled neighborhoods around the country, such as Brooklyns Bedford-Stuyvesant and the Watts area in Los Angeles. All of our cities are in trouble, he said in an interview at the time. The concentration of the disadvantaged and the flight to the suburbs of the middle-class whites thats destroying all our cities. Mitchell Energy purchased fifteen thousand acres of land twenty-seven miles north of downtown Houston and began building a planned city that would embrace his evolving views on the environment and sustainability. He spent evenings at home with his kids, playing with an elaborate electrical train set and designing forests for his new city.<sup>8</sup>The companys bankers were dead set against his project, however, viewing it as a distraction and likely money loser. They refused to lend \$10 million to get it going. Mitchell persevered, siphoning enough cash from his company to begin building The Woodlands, a mixed-income development. Mitchell planted tall trees, built flowing waterways, and banned billboards in his new city. He decided that pine trees would blend with waterways and residents would be discouraged from cutting their grass, to create a natural look. The Woodlands opened in 1974 and became the companys headquarters, though some investors and bankers continued to grumble about it. Mitchell himself grew frustrated when he tried to introduce wild turkeys to the development and one of his employees couldnt resist shooting and killing one of the birds.\* \*

\*By the late 1970s, George Mitchell had much bigger problems than real estate and wild turkeys. His key Wise County field was beginning to run dry and his experts warned that the company had about ten years left before a severe decline in gas production would begin. Mitchell Energy had committed to delivering one hundred million cubic feet of gas daily to the pipeline feeding Chicago. Mitchell couldnt see how his company could continue to meet its obligations, or where its future source of gas would come from, and he didnt know what to do. You could see it fading, he says. I knew our gas stream was getting weaker. In a few more years I knew wed be in trouble. As oil and gas prices weakened and Texas real estate stumbled in the mid-1980s, pressure grew. It didnt help that demand for natural gas was lagging behind coal and nuclear power. Mitchell and his men had spent years hunting the country for new sources of gas, in anticipation of their key field running dry. The efforts had largely met with abject failure, however. In the 1970s, Mitchells team had explored a sandstone formation called the Clinton that extends through Ohio, New York, and Pennsylvania. Huge amounts of gas could be found in the region and it had close access to the energy-hungry East Coast, exciting Mitchell executives. But the natural gas, called deep-basin gas, was below the

level of most reservoirs and was tightly packed, making it a challenge to tap. While the Mitchell crew was experienced with fracking, their efforts were a waste of time. We nursed and piddled along in that area over a period of time and nothing really ever developed of any great consequence, recalls Jack Yovanovich, Mitchells land-buying pro. A promising spot in the Rockies turned into just as much of a disappointment. Mitchell chased other areas, from Whittier, California, to New Mexico, only to retreat back to Texas each and every time. Mitchell was still searching for a way out of his quandary in 1981 when he read a research paper one of his veteran geologists, Jim Henry, had submitted to a geological publication. Mitchell was such a control freak that he demanded to see every paper submitted by employees to any periodical, so he got an early peek at Henrys research. The paper described a thick rock called shale that was found deep below Mitchell Energys acreage in Wise County. Rock layers below the surface are stacked on top of one another like pancakes; shale is one of the deepest pancakes in the ground. The layer in Texas was called the Barnett Shale, a name originating in the early twentieth century. Thats when geologists mapping the area noticed solid, black, organic-rich rock in an outcrop near a stream. They gave it a name inspired by the nearby Barnett Spring, itself named for John W. Barnett, a farmer in Texas San Saba County. Most of the shale formation was a mile or more below the surface, and it ran under much of North Texas, even below the city of Fort Worth. Mitchells employees had drilled through the Barnett Shale every once in a while, on their way to even deeper sedimentary rock formations. When they passed a drill bit through this shale, they often noticed gas shows, or tantalizing indications that this rock likely held substantial amounts of natural gas. The gas kicks from the rock were promising signs, but Mitchell and his men usually ignored them, as others had. It just seemed too hard to extract gas from this tight rock so far below the surface. Drillers had long deemed it fruitless to target other shale layers around the country, even when they seemed to hold gas. Indeed, in 1976, the Department of Energys Eastern Gas Shales Project had determined that a substantial amount of gas was held in shale in Appalachian, Illinois, and Michigan basins. The study focused some attention on this rock, but it was considered too expensive to try to produce gas from it. Those sedimentary layers were in the eastern part of the country and nowhere near Texas. So the project was of limited help to the Mitchell team. By 1980, drillers saw the Barnett Shale formation as little more than a marker indicating that another, more attractive layer called the Mississippian might be close by. There didnt seem much more reason to pay attention to this shale rock. Jim Henrys paper was one of the first to detail the Barnett rock formation and to demonstrate that it might be full of oil and gas that actually might be extracted. Henry was proud of his paper, which effectively took the Barnett area off the industrys back burner. Even he didnt jump up and down at his results or tell his bosses to actually start drilling in the area, however. I made reference to hydrocarbons in the Barnett, Henry says, but I was not advocating that anyone run out and drill these expensive wells. Mitchell, desperate to find a new source of gas, was excited despite Henrys caution. If Mitchell somehow could tap this shale layer that his company already was sitting on, he figured he might finally have an answer to all his problems. Drilling deep in the Texas fields was no more than a hunch, the best option he could come up with. Mitchell Energy already had invested a lot of money to build infrastructure to gather and process natural gas in the area. And the company held about 400,000 acres in Wise County. It made sense to at least see if this rock deep in the ground might produce gas, Mitchell decided. I thought maybe it would work in the Barnett because there are a lot of large faults, and a lot of movement in the earths crust, and I thought that could lead to gas, he says. We had a better chance of getting gas there than anywhere else at the time. Mitchell was newly enthused about shale. But this rock and its tantalizing potential wasnt any kind of big secret in the energy patch. Most experts scoffed at drilling in shale, seeing it as the fools gold of the energy business, a waste of time compared with much more promising types of rock below the surface. Although oil and gas is said to lie in reservoirs, petroleum deposits dont accumulate in anything resembling a subterranean pool. Theyre trapped within beds of various rock, hiding in the pore spaces within the rock. That helps explain the derivation of the word petroleum from the Latin word *petra*, for rock, and *oleum*, for oil. For decades, drillers focused on the oil and gas in various layers of rock closest to the surface. By the 1980s, though, it had become harder to find large deposits of energy in those nearby layers. Thats why George Mitchell became intrigued about the idea of going farther down, into shale. Like other forms of petroleum, oil and natural gas in shale formed from the accumulated remains and excrement of plankton, algae, and other organisms that lived in large bodies of water, hundreds of millions of years ago. That origin explains why the term fossil fuel became popularized. Over time, the organic-rich matter accumulated in various layers of sediment and was compacted and solidified, with new layers on top of it, just like a layer cake. As the organic material was subjected to the intense heat and

pressure found below the surface, it sometimes turned into oil; other times, when there was more heat deep in the ground and therefore more cooking, it became tiny bubbles of odorless natural gas. The heating process also sent a lot of that oil and gas migrating upward toward the surface, like fat rising to the top of broth, until it was trapped in a higher rock formation with a seal preventing it from rising any farther. Industry members had long called shale a source rock because it was understood to be the layer of rock that was the source of most of those oil and gas deposits found closer to the surface. Just as food is cooked in a kitchen and brought out to a dining room, oil and gas spent thousands of years cooking in these shale layers before it slowly made its way to reservoirs closer to the surface. A lot of the oil and gas remained trapped in these layers, though. Indeed, there were few geologists who hadn't yearned to go straight to these layers of dense, often black rock to tap it for all its remaining energy deposits. Just as a hungry teenager would rather storm the kitchen than wait patiently at the dinner table, operators would have preferred to go straight to the shale than wait for its oil and gas to rise closer to the surface. Fervor for this rock usually led to bitter disappointment, however. The first commercial natural gas well in the United States was in a shale formation in Fredonia, New York, in the early nineteenth century. But energy companies quickly moved away from this rock. It just didn't seem possible to easily extract oil or gas from shale. Sure, shale had a lot of pores, allowing it to store oil and gas. But the rock was too tight and compressed. In other words, there weren't enough connections between those pores. Trapped oil and gas didn't seem to have necessary pathways for it to flow to a wellbore, or a hole drilled into the ground to create a well. Much of the oil and gas in shale eventually makes its way to shallower rock formations near the surface through natural fractures in the rock.

But because shale is so compressed, this process can take millions of years. Geologists knew oil and gas remained in shale formations around the country and around the world, but it seemed much too expensive to try to go get it. The rock had such low permeability that it just didn't seem worth the time, cost, and effort.

Whatever oil or gas shale held, it sure didn't seem to want to give it up. In the field the stance was that it wasn't economical, the formation wasn't viable and couldn't make enough gas, says Jay Ewing, an engineer who worked for a rival of Mitchell Energy in the early 1980s.<sup>9</sup> Complicating matters, shale layers were just too far down as much as two miles below the surface adding to the difficulty and cost. Besides, it also wasn't clear how much oil and gas remained in shale, since so much of it had already flowed up to the surface. Most experts were dubious that there was enough pore space in shale to contain very much oil and gas. It was foreign to everyone's thinking that there could be that much gas in this rock, says Dan Steward, a Mitchell geologist. We were all taught that there weren't enough holes. Despite the broad skepticism about this rock,

Mitchell told his team to go ahead and hydraulically fracture the Barnett Shale layer. Their goal was to connect pore spaces and try to create pathways for the gas to flow. The fracking involved pumping thousands of gallons of water and other substances into the rock to create small cracks to help the gas flow to the surface. It was a bit like keeping a thumb on a hose to amplify water pressure and create an impact, in the hope of creating pathways for the gas to escape. Some of Mitchell's troops resisted this method of stimulating the rock, which they didn't think could work. Mitchell listened and acknowledged the doubts, but he pushed forward. Let's fracture it anyway, he told them. Mitchell was determined to be the first to extract serious amounts of natural gas from shale and to do it before his existing fields ran out of gas, scoring a potentially historic windfall and shocking the industry in the process. He knew that if he was successful, the country itself might have a new way of discovering much needed energy resources. In 1981, Mitchell Energy drilled its first well in the Barnett Shale in Wise County, the C.W. Slay No. 1. The results were good, though not remarkable. Most major oil companies weren't focused on the area and didn't notice or even care what Mitchell was doing. Through the 1980s, Mitchell and his company weathered the ups and downs of a difficult industry, still trying to coax meaningful amounts of gas from the Barnett Shale. Profits fell to a meager \$8.4 million in 1986 and rival independent energy companies went belly up. Mitchell trimmed expenses and reduced its budget for exploration in the Barnett. Only one area of the region was showing respectable production, and many of the company's engineers and geologists grew pessimistic. By 1992, it was clear that the Barnett would have to replace Mitchell's natural gas reserves or they'd simply run out of gas. Mitchell pushed his men to make progress. They had tried what they called massive fracks, costly attempts at fracturing rock relying on a technique the government had helped develop. This approach to getting gas to flow from the Barnett layer pumping large volumes of fluid and sand down a wellbore to crack the shale and give it more permeability had worked elsewhere in the state. They also used a gelled water formula that included one million gallons of fluid and nearly three million pounds of sand, to prop the cracks open and allow the gas to escape. It was as if the Mitchell team was giving the earth a massive

enema. Mitchells crew got some gas to flow in, but it was an expensive undertaking and the results weren't especially promising. We couldn't figure out how to make it work, he says.<sup>10</sup> The cost added up to more than \$35 million, a huge sum for the company. We kept trying, trying, trying. Mitchell and his staff weren't getting anywhere. But word of his enthusiasm for the Barnett, and of his promising early tests, began to trickle out. The news piqued the interest of Sanford Dvorin, among the most unlikely wildcatters to risk it all trying to strike it rich in Texas. \* \* \*

Growing up in the Weequahic section of Newark, New Jersey, Dvorin was neighbors with future famed novelist Philip Roth. Dvorin didn't know much about the energy business. Yet from an early age the Jewish child of a meatpacker became excited by the idea of making a fortune in the oil patch. All I knew about oil was that it was huge and everyone needed it, Dvorin later told Ann Zimmerman of the Dallas Observer. It seemed easier than the packing-house business. Boy, was I mistaken.<sup>11</sup>

A wildcatter is an independent operator who searches for oil or natural gas in areas that can be miles from the closest producing well. These men and they almost always are men are equal parts gamblers, salesmen, and geologists. supremely confident, wildcatters drum up financing from banks or investors by describing how they will tap a gusher in a spot others have dismissed, ignored, or misunderstood. They repeat the pitch, no matter how poor their chances of success, until they have the funds to acquire acreage, drill a well, and wait for oil and gas to flow. Wildcatters are responsible for discovering the majority of the nation's oil and gas. By the 1980s, huge gushers were becoming much less frequent in the United States and most of the biggest energy players had moved on to foreign locales. But the allure of the big strike, and the mystique of the wildcatter able to tap a lucrative well that the Goliaths of the industry had missed, captured Dvorin just as it had George Mitchell and countless risk takers before him. Dvorin didn't know anyone in the energy world, nor did he have the first idea how to get started. He received a degree in engineering and moved to Texas in the late 1950s with his brother to be closer to the cattle market, not oil or gas wells. The brothers settled in Dallas and built the largest beef-boning operation in the state, Big D Packing. When his financial backers withdrew their support, Dvorin moved to Tyler, Texas, in 1968 and found himself surrounded by oil and gas workers. He was inspired to follow his childhood dream. Now's the time, he thought. For a while, things went well. Dvorin, heavyset and confident, put together oil and gas deals in north-central Texas and made enough money to raise a son and daughter with his new wife in Plano, an upscale bedroom community outside Dallas. In 1976, while searching for new drilling prospects in a local oil industry library, Dvorin decided to examine the history of drilling in the Dallas County area. Most energy companies ignore urban areas, for the obvious reason that it's harder to obtain municipal approvals and persuade homeowners to lease land in more congested areas. George Mitchell once had considered drilling in the Dallas County area, but quickly reconsidered. The hesitance by larger competitors made Dvorin think there just might be some overlooked oil right there in suburbia. There wasn't much in the Dallas database, but Dvorin found a well that was widely known among some early Barnett workers; it had been drilled two decades earlier by a company that later became part of the giant Mobil. The file didn't give details of where the well was. And all the Barnett activity was in Wise and Denton counties, where Mitchell was drilling, about fifteen miles away.

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