Stoned: A Doctor's Case for Medical Marijuana

David Casarett M.D.
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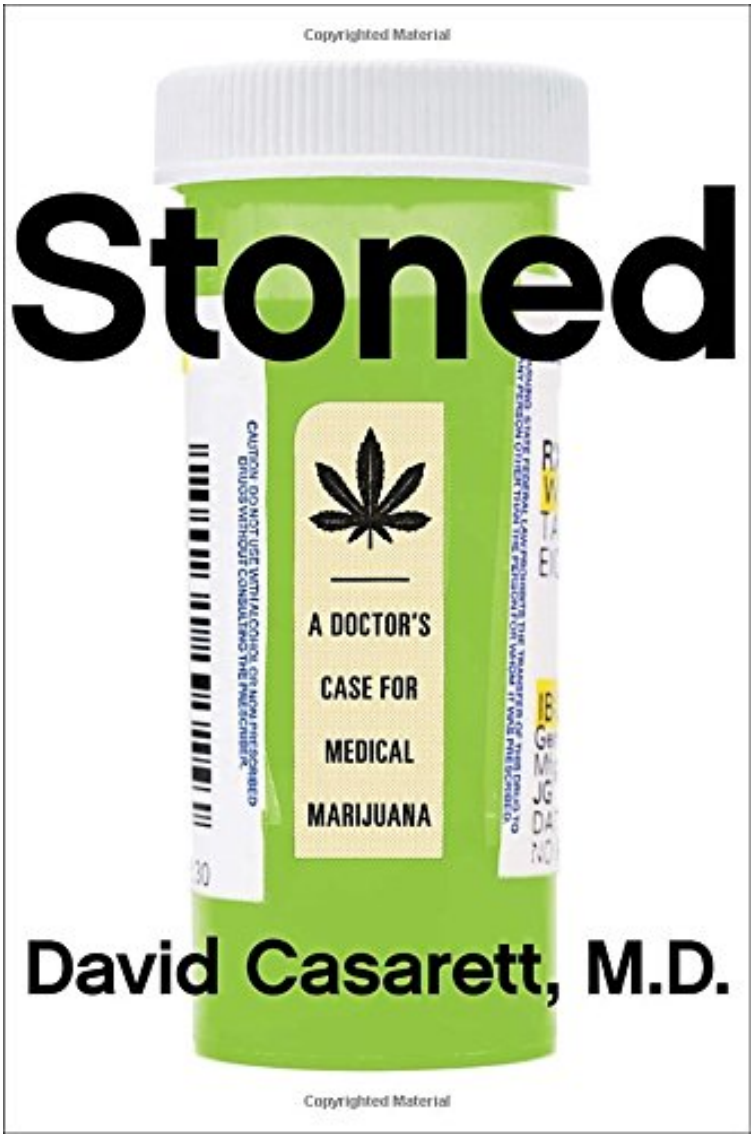

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David Casarett M.D. : Stoned: A Doctor's Case for Medical Marijuana before purchasing it in order to gage whether or not it would be worth my time, and all praised Stoned: A Doctor's Case for Medical Marijuana:

18 of 18 people found the following review helpful. Casarett addresses the issues of safety and efficaciousness of medical marijuana with science.By BHBStoned is a hospice physician's attempt to move the subject of medical marijuana away from Cheech and Chong and review the existing science (and lack thereof) about what is in cannabis (much more than just THC), positive and negative effects for patients suffering from a variety of diseases, how the

active compounds might best be delivered to these patients, assess what research is still needed, and the many difficulties inherent in cannabis research. Dr. Casarett offers the reader some sane, well-rounded research, analysis, discussion, and interviews, along with anecdotal observations and a pot brownie recipe in his efforts to answer the question of whether medical marijuana is both safe and efficacious. Dr. Casarett points out that the answers may be yes, no, maybe, or we don't really know, depending on the disease, pain, or symptom being treated, the physiology of the patient, what form the cannabis is in, and how it is delivered.I was initially interested in this topic after Colorado passed Amendment 64, legalizing recreational marijuana at the same time my older son moved there. I found it interesting that Colorado went ahead with legalization, even before addressing some of the inherent difficulties, especially the financial and law enforcement ramifications. I'm especially interested in driving under the influence. We all recognize the terrible tolls that driving under the influence of alcohol may take and law enforcement has forensic tools to prove whether a driver is impaired or not, breathalyzer results and the indisputable blood alcohol level. The impairment of drivers under the influence of marijuana has been well-documented; tests of impairment due to marijuana are not quite so clear-cut. Driving while stoned doubles the risk of an accident, the effects persist for hours, but there's currently no reliable sobriety test for users. The author has a friend smoke marijuana and drive around an empty parking lot. Due to a lack of orange cones, he has outlined the course with bananas. After the impaired driver remembers what to do with his feet, the result is many squashed bananas. Casarett states,"If you're thinking of getting high and then driving a car...Don't. Just don't."This book is not an argument for legalization (although the author does change his mind in favor of medical marijuana over the course of writing the book), and Dr. Casarett is genuinely concerned about both the possible positive and negative effects of cannabis. He points out that it can be addictive, it can have negative effects on brain cells, and it is definitely not okay to smoke and drive. The author argues that it's time to test and standardize the quality of the products being dispensed to patients, and to require clinics and dispensaries to educate medical marijuana consumers about both the benefits and risks of cannabis.10 of 10 people found the following review helpful. A Review by Jerry Woolpy of Stoned: a doctorrsquo;s case for medical marijuana by David CasarettBy Jerry Woolpyldquo;Stonedrdquo; is an episodic account of how a skeptical physician learned what is known about Cannabis, its idiosyncratic efficacy, its chemistry, its physiology, its morbidity and mortality risks, and it prospective future for synthesized medicine. The book is chatty enough to be read by interested lay persons and detailed enough to be of interest to biologists and chemists. (It would help to know a little about receptor proteins and hormones and how the same ones can carry different messages in different tissues.) The book tells how the herb is grown, harvested, and prepared. And the various ways it is consumed including the relative efficiency of each method of consumption. Casarett decries the lack of accurate counselling available to potential users, although his book addresses this problem pretty well. Dosage is problematic because the active ingredients are variable and cannot be assured. It may have significant interaction with other medications because it can slow down overall detoxification in the liver and thus increase the effective dose of the other medications. It is addictive, including withdrawal symptoms of clinical anxiety for habitual users. A heavy dose can render a user totally senseless for hours. Operating a car under the influence is extremely dangerous. Nonetheless it is often an effective antidote for nausea and a lack of appetite. Many have found relief from chronic pain and sleeplessness. It is anti-inflammatory. Two unexpected findings are that smoking it has no lasting effect on lungs and provides relief from asthma. For some it greatly decreases the frequency of seizures. Cannabis may even work epigenetically to turn on and off the synthesis of particular proteins. People with coronary heart disease, schizophrenia, or pregnant women are at increased risk of morbidity. The bottom line is that for those in need it might be worth a very careful try. But for the rest of us future research and development could yield an amazing array of tools for controlling immunity, particular kinds of pain, and maybe even personality. Research on Cannabis has been seriously impeded because it is classified by our government as a Schedule 1 substance and therefor of no clinical value. If it were reclassified as Schedule 2, like morphine, clinical trials and other important research would proceed.7 of 7 people found the following review helpful. Send a copy to your local politician.By Giles BecketA must read book. I'm not a pot-head; tried it twice in my youth and hated it, but you need to be up to date in what will surely be increasingly legalized in America. Dr. Casarett writes clearly and basically gives all sides of the argument. He acknowledges that Marijuana almost certainly has medical benefits, and that probably no one has died from its effects over the last 5,000 years. (Contrast that to tobacco and alcohol!) However, he is definitely against driving after using "pot", and has run an experiment to show that unequivocally. The biggest problem with marijuana, however, appears that the dummies in Washington (DC) have, in their usual extreme ways decided to classifying it as a schedule 1 drug, so that for years it has been impossible (and essentially illegal) for scientists to investigate its potential and dangers. I lived in The Netherlands for ten years where marijuana is as easy to buy as coffee or tea, and just as legal, and I didn't notice that the society had fallen apart, indeed the Dutch seem to be eminently sensible people, not prone to hysteria or hyperbole. In the crazy, shoot 'em up society we seem to be living in here, perhaps we could use a little "soma", to quote Huxley.Finally, I knew a policeman once who said that every time he was on duty he had to deal with drunks and their damage (broken bodies and battered wives), but he'd never known a pot-head cause a single problem as a direct result of the drug. If we stopped being so frightened of marijuana then we could empty half the prisons (especially poor black people) and life would be calmer all round. It is time for

our politicians to read this book and stop being so paranoid. If only a biblical figure had been a user, then we'd all have it available by now!

A doctor discovers the surprising truth about marijuanaNo substance on earth is as hotly debatednbsp;as marijuana. Opponents claim itrsquo;s dangerous, addictive, carcinogenic, and a gateway to serious drug abuse. Fans claim it as a wonder drug, treatingnbsp;cancer, anorexia, AIDS, chronic pain, glaucoma, arthritis, migraines, PTSD, and insomnia. Patients suffering from these conditions needmdash;and deservemdash;hard facts based on medical evidence, not hysteria and superstition.In Stoned, palliative care physician Dr. David Casarett sets out to do anythingmdash;including experimenting on himselfmdash;to find evidence of marijuanarsquo;s medical potential. He smears mysterious marijuana paste on his legs and samples pot wine. He poses as a patient at a seedy California clinic and takes lessons from an artisanal hash maker. In conversations with researchers, doctors, and patients around the world he learns how marijuana worksmdash;and doesnrsquo;tmdash;in the real world.Dr. Casarett unearths tales of near-miraculous success, such as a child with chronic seizures who finally found relief in cannabidiol oil. In Tel Aviv, he learns of a nursing home thatrsquo;s found success giving marijuana to dementia patients. On the other hand, one patient who believed marijuana cured her lung cancer has clearly been misled. As Casarett sifts the myth and misinformation from the scientificnbsp;evidence, he explains, among other things:bull; Why marijuana might be the best treatment option for some types of painbull;nbsp;Why therersquo;s no significant risk of lung damage from smoking potbull;nbsp;Why most marijuana-infused beer or wine wonrsquo;t get you highOften humorous, occasionally heartbreaking, and full of counterintuitive conclusions, Stoned offers a compassionate and much-needed medical practitionerrsquo;s perspective on the potential of this misunderstood plant.

ldquo;A thoroughly researched analysis, Stoned brings welcome objectivity to an important but contentious topic. Casarett applies a unique mix of science, humanity, and even humor to effectively dispel common myths and misconceptions about medical marijuana. Stoned will be a valuable resource for patients, health-care providers, and policy makers.rdquo; mdash;Nadine Strossen, former president, American Civil Liberties Union ldquo;This well-researched and delightfully told chronicle humanizes the medical marijuana movement in a way that should move even the most skeptical reader. A master of clever analogy, Dr. Casarett now joins Dr. Sanjay Gupta as a prominent physician helping to mainstream medical marijuana so that someday even more may benefit from its therapeutic effects.rdquo; mdash;Donald I. Abrams, M.D., chief, hematology-oncology, San Francisco General Hospital; professor of clinical medicine, University of California San Franciscoldquo;A highly readable weaving of anecdote and evidence that confirms that marijuana is a medicine, a medicine that needs honest, unfettered research to properly exploit its benefits. Give a copy to a doubter.rdquo; mdash;Clint Werner, author of Marijuana Gateway to Healthldquo;A dramatic and accessible tale that combines interactions with front-line researchers and compelling patients to give readers an intriguing look at how to reason about this controversial plant.rdquo; mdash;Mitch Earleywine, Ph.D., board chair, National Organization for the Reform of Marijuana Laws (NORML)About the AuthorDAVID CASARETT, M.D., the author of Shocked, is a physician, researcher, and tenured professor at the University of Pennsylvania's Perelman School of Medicine. His studies have resulted in more than one hundred articles and book chapters, published in leading medical journals such as JAMA and The New England Journal of Medicine. His many awards include the prestigious U.S. Presidential Early Career Award for Scientists and Engineers. He lives in Philadelphia.Excerpt. copy; Reprinted by permission. All rights reserved.1The Blacksmith and the BoxerThe mobile home has traveled many hard miles. Like old luggage, its tan exterior is scuffed and faded and marred by countless dents. In the gusty wind blowing across the surrounding field on the outskirts of Denver, its frame rocks restlessly on bald tires, making it seem alive. The windows are obscured by curtains. A poster on the door shows the outline of a human-shaped shooting target, pocked with bullet holes. The caption below it reads ldquo;Therersquo;s nothing in here worth dying for.rdquo;I turn to the man standing next to me. Nathan Pollack is in his seventies, with snow-white hair and a whorled white beard that ends in a sharp point at his chin. His black beret and rumpled tweed sport coat make him look like he could be a professor at a small liberal arts college. He is in fact a hospice doctor, like me, and hersquo;s about to introduce me to a patient whose story I very much want to hear.I knock, and the door opens a few inches, revealing the head of an enormous dog with bulbous eyes and small, clipped ears. His intimidation potential is elevated a bit by the fact that his teeth are at the level of my throat.It turns out that the dogmdash;all eighty pounds of himmdash;just wants someone to scratch behind his ears. Still, I let Pollack go in first.Inside, the mobile home smells of stale marijuana smoke, dog, old socks, and compost. The interior is dark despite the bright winter day outside. Several heavy quilts cover the windows as insulation against the biting wind, and another covers the doorway that leads to the cab in front. The cozy womblike space is crammed with a bed, two small chairs, and a tiny kitchen area. Therersquo;s faded wallpaper and a mock-Tudor ceiling constructed of stucco interspersed with faux wood beams. Itrsquo;s oddly homey.As my eyes adjust to the dark, I get a good look at the man Pollack has brought me to meet. Caleb* is in his forties, lean and wiry. His neatly trimmed mustache is at odds with brown hair thatrsquo;s long and boyishly unkempt. Hersquo;s sitting cross-legged on his bed, warmly dressed in a

thermal long-sleeved shirt, a flannel shirt, jeans, and well-worn athletic socks.Calebrsquo;s hands are shaking, and I recognize the resting tremor of Parkinsonrsquo;s disease. He tells me that he got that diagnosis several years ago and thinks the unusually early onset is probably a result of his work as a blacksmith and a welder. ldquo;You inhale every heavy metal known to man,rdquo; he says. ldquo;No surprise that they do all kinds of damage to your brain.rdquo;I ask him his dogrsquo;s name, and Calebrsquo;s face contorts into what might pass for a smile.ldquo;Rocky.rdquo;Of course. What else would you call a boxer? I laugh, and Caleb does, too. He clutches his left side in obvious pain. Then that passes, and he starts to tell me the story I came to hear.Two years ago, he was diagnosed with rectal cancer. He received what he described as ldquo;aggressiverdquo; treatment in Wisconsin. ldquo;Some days I didnrsquo;t think I could take any more,rdquo; he says. ldquo;But then Irsquo;d go by the childrenrsquo;s hospital and Irsquo;d watch those kids playing outside and Irsquo;d think, lsquo;If they can handle this, then I can, too.rsquo;rdquo;His doctors told him that treatment could prolong his life, but wouldnrsquo;t cure him. So he suffered through as much treatment as he could stand, and then he drove west to Colorado where he knew hersquo;d be able to get marijuana legally to treat his pain and control his nausea.Along the way, he also discovered that marijuana didnrsquo;t only relieve those symptoms.ldquo;It also keeps me from being an asshole.rdquo; He pauses. ldquo;Well, too much of an asshole, anyway. It sort of blunts the sharp edges. Irsquo;m not so pissed off all the time about everythingmdash;at everyone.rdquo;ldquo;Having cancer sucks,rdquo; he admits. ldquo;But when yoursquo;ve got your red cardrdquo;mdash;thatrsquo;s Coloradorsquo;s medical marijuana cardmdash;ldquo;dying sucks a little less.rdquo;It turned out, however, that getting marijuana wasnrsquo;t so easy.As soon as he parked his mobile home in this suburb outside of Denver, Caleb found Pollackrsquo;s hospice, which promised free marijuana to its patients. Thatrsquo;s essential, because Caleb lives on about $600 a month. But Pollackrsquo;s hospice had stopped providing marijuana because the management didnrsquo;t want to run afoul of federal laws that still classify marijuana as an illegal substance. So once he was in Denver, Caleb wasnrsquo;t able to get marijuana from Pollackrsquo;s hospice, and he couldnrsquo;t afford to buy his own.As Caleb tells his story, he drops the courtly politeness with which hersquo;d greeted me a few minutes ago, and his language becomes increasingly laced with profanity. He goes on to say how much he depends on the marijuana he smokes. But he canrsquo;t afford it.ldquo;Oh, therersquo;s plenty of places to buy. Thatrsquo;s the hell of it. Sure itrsquo;s legal, butnbsp;.nbsp;.nbsp;.rdquo; He rubs his thumb and forefinger together in the universal sign for money. ldquo;You have to be able to pay.rdquo;I ask him if hersquo;d found another hospice that could give him marijuana, and he grins.ldquo;No, I didnrsquo;t really look.rdquo; He winks at Pollack. ldquo;Irsquo;ll complain, sure. Irsquo;m not shy. Especially when Irsquo;m pissed off. But these are good folks. They take good care of me.rdquo;Hersquo;s stayed with Pollackrsquo;s hospice, and hersquo;s gotten marijuana from so-called angels in the community who make donations directly to him. That keeps the hospice out of trouble, which is fine with Caleb.ldquo;I wouldnrsquo;t want anybody going to jail for me.rdquo;Besides, he has a plan.ldquo;Irsquo;m growing my own. See?rdquo; He points.To my left, at the rear of the mobile home, therersquo;s a grow light suspended over a plastic tub. The light sways gently in the wind, casting undulating shadows of what looks like about thirty immature marijuana plants. A few are about eighteen inches tall and look like they might start budding in a couple of weeks. But most are no more than a couple of inches high.Caleb admits that those smaller plants were the result of an accident. Literally. He went to pick up plants from someone who was moving and wanted to give them a good home. But problems ensued.ldquo;Irsquo;m not the best driver, you know?rdquo;I look back at the psychoactive garden. I nod.Caleb is a little vague about details, but apparently while he was driving, the microwave fell off its shelf and several plants lost their lives. He salvaged what he could by taking cuttings and creating clones, which are the Lilliputian plants that take up most of his little greenhouse.I notice a box on a shelf behind him. Itrsquo;s labeled COMFORT KIT.This is a set of medications that many hospices provide to their patients in case of emergencies. It generally includes morphine for pain, and benzodiazepines like Valium for anxiety and seizures.Has he used them?ldquo;Hell no. They donrsquo;t work. Why would I waste my time with them?rdquo; He gestures at a dime bag of marijuana on the kitchen counter. ldquo;Thatrsquo;s all I need, right there.rdquo;Caleb recognizes the irony of this arrangement. His hospice can provide a variety of drugs such as morphine free of charge. These are drugs that have the potential to cause a fatal overdose, and which can be addictive. But the drug that really helps himmdash;marijuanamdash;is out of reach.ldquo;Those are your tax dollars at work, man. Yoursquo;re paying for the government to spend money on that box of shitty drugs that Irsquo;m not going to touch. Thatrsquo;s a waste. But what I really need, they canrsquo;t give me. Does that make sense?rdquo;I admit that it doesnrsquo;t. As if in agreement, Rocky the boxer hops off the bed where hersquo;d been sitting with Caleb and rests his chin on my leg.Does Medical Marijuana ldquo;Workrdquo;?In Pollackrsquo;s Toyota, heading back to Denver, I think about Calebrsquo;s predicament. Irsquo;m a little shell-shocked by what Irsquo;ve heard. Irsquo;d always thought of medical marijuana as a joke. Or a ldquo;treatmentrdquo; that would always be described in just that way, hemmed in by ironic quotes.Yet Caleb is dying and in pain. And he wants itmdash;needs itmdash;for relief. This isnrsquo;t a guy who wants to get high for fun. This is a man who has led a hard life and who doesnrsquo;t want to suffer more than he has to.Some patients Irsquo;ve taken care of in my work as a hospice and palliative care doctor have admitted to me that they use marijuana for symptoms like pain or nausea. (And Irsquo;m pretty sure that for every patient who has been

honest with me about using marijuana, there are many more who havenrsquo;t.) Theyrsquo;ve made it into a joke, just as I have.Laughing uncomfortably, one Vietnam veteran told me he started smoking half a joint per day more than twenty years ago to control his PTSD symptoms. Better to be high than out of his head, right? I laughed, too, and we moved on to talk about his cancer pain that I was treating.Irsquo;m pretty sure I shouldnrsquo;t have laughed. Like Caleb, that veteran needed help. Hersquo;d found something that relieved his symptoms, and he needed my support.I donrsquo;t remember what I said. Probably some version of what all doctors say when confronted with alternative medicine we donrsquo;t understand (or, in the case of marijuana, common but usually illegal). ldquo;Well, I guess it canrsquo;t hurt.rdquo; Or, ldquo;If it makes you feel betternbsp;.nbsp;.nbsp;.rdquo; But I didnrsquo;t ask him whether it helped him, or how.Marijuana is the only thing thatrsquo;s helped Caleb. This is a guy who is letting $100 worth of morphine and other interesting drugs sit in his closet. Hersquo;d rather have a joint.Whatrsquo;s more, Caleb turned to marijuana to avoid drugs like morphine. Not only is he convinced that marijuana is helpful, hersquo;s convinced that itrsquo;s better than the legal drugs he can get for free. It might be safer, too.nbsp;bull;nbsp;bull;nbsp;bull;nbsp;Does marijuana ldquo;workrdquo;?When I met Caleb in early 2014, the debate about legalizing medical marijuana was just beginning to get national attention. But that debate was about ethics and morality. Do people have a right to use it? And how should laws be crafted?No one was really talking seriously about whether marijuana has any medical value. Or whether itrsquo;s safe. Or, setting the bar a little lower, whether itrsquo;s at least as safe as other drugs that doctors prescribe.My goal with this book is to shift the national discussion, and to bring these questions about effectiveness and safety to the forefront. These are the questions we really need to be asking. And these are the questions that I wanted to be able to answer in order to decide, as a physician, what advice I should give my patients when they ask me whether they should use medical marijuana.In this book Irsquo;ve attempted to look carefullymdash;and criticallymdash;at the evidence. I searched for high-quality published studies, and I interviewed researchers who are doing those studies. In short, I subjected medical marijuana to the same scrutiny that Irsquo;d give to the drugs that the pharmaceutical industry tries to sell to physicians like me.First, I investigated whether marijuana works as medicine. I scoured medical journals, interviewed patients, and visited physicians and researchers. I wanted to find out what we know about marijuanarsquo;s effect on conditions related to the brain, such as insomnia and PTSD and seizures. I wanted to learn whether it could be useful in treating physical symptoms such as nausea and weight loss, and whether the ingredients in marijuana might actually treat diseases like dementia, multiple sclerosis, or cancer.Then I explored how people get marijuana into their systems. That might seem like a silly question, but itrsquo;s not an easy one to answer. I learned how to infuse the ingredients of marijuana into beer and wine and brownies and ointment. I discovered how effective joints and bongs are at delivering marijuanarsquo;s ingredients to our brains compared to newer technologies such as vaporizers. Along the way, I learned how to make hash. I even discovered what Irsquo;ve been told is the worldrsquo;s best pot brownie recipe. (Here, in case you want to skip ahead.)All that is great, but is marijuana safe? For most readers of this book, this might be the most important question. So I sifted through the evidence about whether long-term use causes brain damage, or mental illness, or addiction. I discovered there are other risks of marijuana use beyond its effects on the brainmdash;from infertility to shrinking penises and everything in between. Irsquo;ll also share my own misguided experiences with medical marijuana, and Irsquo;ll take you for a drive with one of my patients shortly after he smoked a joint.Next, how are patients like Caleb figuring out whether marijuana could help them? How do they sort through the risks and potential benefits of this stuff? Where do they turn for advice? And how reliable is that advice?Finally, what does the future hold for medical marijuana? Is it on its way to being the next superdrug? Should it be legalized and made more available? Or is this all merely hype to justify recreational drug use?These are high-stakes questions. As of this writing, twenty-three states and the District of Columbia have legalized marijuana for medical purposes, and a few have allowed it for recreational purposes, too. It seems very likely that medical marijuana will be legal in most states in the not-too-distant future. And in states where itrsquo;s legal, lots of people are using it. According to one study in California, 5 percent of people surveyed had used medical marijuana.1 That means that my questions about marijuanarsquo;s effectiveness, and especially its safety, have big implications for hundreds of thousands of people.These numbers are likely to increase further as more dispensaries open to sell marijuana. That was the conclusion of another study in California that surveyed more than eight thousand people in fifty cities and mapped their proximity to marijuana dispensaries. The results: people who were close to a dispensary used more marijuana.2The states that have legalized it have done so with very broad criteria. You can use it for chronic pain, anxiety, insomnia, arthritis, and a wide variety of other conditions. Most people who are embracing it are not near the end of life. They are students, construction workers, police officers, teachers, andmdash;I can attestmdash;at least one doctor.If medical marijuana works, then its growing popularity is good news. But if it doesnrsquo;t work, then itrsquo;s an enormous waste of time and money. Even worse, if marijuana isnrsquo;t safe, wersquo;ll have an enormous public health crisis on our hands. As yoursquo;ll see later in the book, if lots of people are using medical marijuana, even a very small risk could result in lots of people being harmed or even killed.As I started writing this book, the public was just beginning to recognize those risks. For instance, one study found that long-term marijuana use was associated with brain atrophymdash;in other words, brain shrinkage.3 But shortly after that rather alarming study made headlines, The New York Times published an editorial in

favor of legalizing medical marijuana, and discounting its risks. So is it safe or not?4Whether marijuana is safe and effective is particularly important because its safety will determine how itrsquo;s regulated. For much of its recent history, marijuana has been classified in the United States as a Schedule I substance. This category is reserved for drugs like heroin that are believed to have significant risks but no known medical benefits. As long as marijuana continues to live in that category, itrsquo;s going to be impossible to create national rules about how it can be used, prescribed, and distributed. Itrsquo;s also very difficult for researchers to do studies that can help us figure out whether and how it works. And patients like Caleb wonrsquo;t be able to get it from a hospice.I wasnrsquo;t sure where Irsquo;d come out on the other end of this journey. Pro or con? Irsquo;m also not sure which side yoursquo;ll be on when you reach the last chapter. But no matter what your verdict, I think I can promise you an interesting journey that will give you enough information to make up your own mind about whether marijuana could help you.Finally, a book about pot wouldnrsquo;t be complete without some caveats.First, a word about names: Throughout this book, Irsquo;ll be referring to ldquo;marijuana,rdquo; over the objections of some purists who prefer the term cannabis, as in Cannabis sativa. They correctly note that the name marijuana (actually marihuana, imported from Mexico) was bestowed by narcotics enforcement officials back in the 1940s as a way to scare off potential users. Back then, the connotations of foreignness and crime (think Reefer Madness) were enough to deter a few people. (Of course, those connotations also probably made the stuff irresistible to others.) Although I admit that cannabis is the proper term, marijuana is so widely recognized that Irsquo;ve chosen to use this name instead, with all due apologies to terminological purists.Second, you shouldnrsquo;t rely on this book as your sole source of medical advice. If you want to learn how to treat symptoms like pain, you should also see a physician.However, this book will help you decide whether medical marijuana might help you. Irsquo;ve written it for people like my own patients, and like Caleb, who are struggling with distressing symptoms and looking for help. Itrsquo;s intended to be a summary of the sort of advice I would want them to have when theyrsquo;re deciding whether medical marijuana might help them.For instance, Irsquo;ll tell you how medical marijuana can be helpful, and what symptoms itrsquo;s most effective in treating. Irsquo;ll also warn you about marijuanarsquo;s risks, and how you can avoid them. Along the way, Irsquo;ll tell you enough about the science of medical marijuana to understand how it works, and what it might be able to do for us in the future.2The Girl Who Talked to Cats: Marijuanarsquo;s Benefits for the BrainThe woman sitting in the seat next to me in the waiting room of this medical marijuana clinic is in her early thirties, blond, and very attractive. Julie is dressed in the sort of fleece-and-spandex garb that might signal a recent Ashtanga yoga session, or an impending hundred-mile ultramarathon. She is undoubtedly very healthy, and could, in a fit of poetic license, be described as ldquo;glowing.rdquo;Like the other people sitting around us, she has come to this Denver clinic to get a card that will let her purchase marijuana legally to treat a variety of symptoms and conditions. Unlike everyone around us, though, she doesnrsquo;t appear to have any such problems. In fact, Julie seems about as healthy as itrsquo;s possible for any human being to be.Thatrsquo;s why I struck up a conversation with her, and thatrsquo;s why shersquo;s telling me about how marijuana has changed her life.ldquo;Itrsquo;s totally reset my brain,rdquo; she tells me earnestly.Julie explains that smoking a joint every daymdash;and sometimes moremdash;has given her a calmer outlook. She sleeps better and has more energy during the day. Marijuana has reduced her anxieties about her job and her relationships, and itrsquo;s also helped her to focus on a novel shersquo;s been working on.ldquo;It really helps me to put everything else aside and focus on being creative.rdquo; She pauses. ldquo;Lewis Carroll used it, you know. What did you think was in that hookah the caterpillar was smoking?rdquo;Alas, her claim about the author of Alicersquo;s Adventures in Wonderland is probably an urban myth. Still, Irsquo;m impressed by Juliersquo;s fervent endorsement of medical marijuana. Irsquo;m particularly impressed by the wide variety of benefits she ascribes to it, from decreased anxiety to increased creativity.ldquo;Itrsquo;s made me a whole new person,rdquo; she says.As the receptionist calls her name, Julie stands up and flashes me a radiant smile. Then she strides off purposefully to pick up the renewed recommendation that shersquo;s convinced has changed her life.Could medical marijuana really do everything that Julie says it has?Irsquo;ll give you a curated tour of what we know about what marijuana can do for us, and wersquo;ll start with the problems for which marijuana seems like an obvious treatment. Marijuana affects the brain, so wersquo;ll start with problems that are brain related, such as insomnia, anxiety, dementia, and seizures. During this tour, Irsquo;ll focus on where the evidence is. Irsquo;ll emphasize the medical problems for which marijuana seems to be effective. Irsquo;ll leave out some problems and symptoms for which we donrsquo;t yet have much evidence, but Irsquo;ll give you a guide that will be more helpful than a simple laundry list of possible benefits, hypotheses, and conflicting opinions would be.The Woman Who Played Scrabble with HerselfOf all of the medical reasons why people use marijuana, Irsquo;ll start with the simplest and the most obvious: sleep. Can marijuana help us get a good nightrsquo;s sleep? Alice is hoping that it might.Alice is in her midfifties, and her graying hair is pulled back in a neat bun. Shersquo;s wearing a simple linen dress and no makeup or jewelry except for a plain wedding band. She could be a Mennonite housewife from eastern Pennsylvania, except that shersquo;s in a medical marijuana clinic in Southern California.ldquo;I canrsquo;t sleep,rdquo; she says when I ask her why shersquo;s here. ldquo;I canrsquo;t fall asleep until three or four in the morning. And even if I do, I wake up again a few hours later.rdquo; Alice admits shersquo;s had this problem ever since she got married twenty-six years ago.Therersquo;s room here for a series of questions

about a husband who is a restless sleeper or who snores. But Irsquo;m talking to people like Alice not as a doctor but as a visitor in a medical marijuana clinic. Besides, Irsquo;m learning that by the time people like Alice turn to medical marijuana, theyrsquo;ve already tried most of the easy, conventional solutions. Instead, I ask her what else she has used to help her sleep.ldquo;Oh, lots of drugs.rdquo; Alice pauses, thinking. ldquo;Lots and lots. Gosh, Ambien, Ativan, Restoril, Xanax.rdquo; She goes on to say shersquo;s tried over-the-counter drugs, too, such as diphenhydramine (Benadryl) and even melatonin. ldquo;Even if they got me to sleep at first, theyrsquo;d wear off and Irsquo;d be wide awake in the middle of the night and staring at a Scrabble board.rdquo;Alicersquo;s doctor told her that she shouldnrsquo;t just lie in bed when she couldnrsquo;t sleep. She should get up and do something. So she started playing Scrabble against herself.Other specialists recommended other remedies, including more exercise (or less), a bedtime routine, a white-noise machine, meditation, a new mattress. She shrugs. ldquo;Nothingrsquo;s helped.rdquo;Then a friend mentioned that shersquo;d started using marijuana for joint pain. ldquo;She said it worked, but she didnrsquo;t like it because it made her sleepy. And so I thought, well, feeling sleepy doesnrsquo;t sound so bad. Why not?rdquo;The woman behind the counter calls Alicersquo;s name and she stands up.ldquo;Well, here goes nothing.rdquo;She seems hopeful, but surely shersquo;s been in this position many times before, trying yet another treatment. Does she think it will help her sleep?Alice shrugs. ldquo;Who knows? But I imagine it will be an adventure, donrsquo;t you?rdquo;I surely do. And I hope Alice finally got a good nightrsquo;s sleep.The 2,700-Year-Old Drug DealerItrsquo;s unusual for an archaeological find to be reported by international news networks, but there are exceptions. In fact, the discovery of a 2,700-year-old stash of marijuana resulted in a firestorm of publicity that was entirely predictable.1In the 1990s, farmers in Chinarsquo;s Gobi Desert stumbled across a field of unmarked graves near Turpan, in the Xinjiang-Uygur Autonomous Region. Archaeologists subsequently began to map what would turn out to be an enormous cemetery covering some 54,000 square meters. Excavations would unearth more than two thousand tombs, some more than three thousand years old.What captured the worldrsquo;s interest, and what spread around the worldrsquo;s news outlets with an astonishing rapidity, was the report in 2008 that one of the tombs contained about a pound of marijuana. This tomb was apparently the final resting place of a male of about forty-five years old. He was interred with possessions that indicated that he enjoyed considerable social standing, and that he was a shaman.The archaeologists discovered a large leather basket filled with something the official scientific report describes helpfully as 789 grams of ldquo;vegetative matterrdquo; which was initially assumed to be coriander. Soon they began to suspect that this vegetative mattermdash;belonging to a shaman, the preeminent member of the prehistoric culturemdash;might be something else. Once it was submitted for chemical analysis, it proved to be Cannabis sativa. That is, marijuana. Predictably, the international news went bonkers, with headlines shouting ldquo;Worldrsquo;s oldest marijuana stash totally busted.rdquo;2The next step was to run a chemical analysis of the stash. There are several dozen cannabinoid molecules in marijuana, but tetrahydrocannabinol (THC) and cannabidiol (CBD) are present in the greatest amounts, and we know much more about them than about any of the others.Of the two, THC is responsible for most of marijuanarsquo;s effects on the brain. So, if Alice is sleeping better now thanks to marijuana, that will be because of marijuanarsquo;s THC. However, itrsquo;s also THC that causes marijuanarsquo;s psychoactive effects, such as feeling stoned. On the other hand, cannabidiol wonrsquo;t put you to sleep, and it wonrsquo;t make you high.We know that THC is responsible for most of marijuanarsquo;s effect on the brain because of a series of experiments that Raphael Mechoulam and colleagues did back in the 1960s. Mechoulam, an Israeli organic chemist who is widely regarded as the grandfather of medical marijuana, was looking for a way to define the psychoactive effects of marijuana on rhesus monkeys, and he and his team studied THC.The results of those experiments should be of considerable interest to an insomniac like Alice. At a THC dose of 1 mg/kg, one of Mechoulamrsquo;s articles reports, the monkeys became drowsy, lethargic, and had difficulty keeping their eyes open.3 That is, they got sleepy. At a higher THC dose of 2 mg/kg, the monkeys became immobile and uncoordinated, then they fell asleep.A patient like Alice would be relieved to learn that these effects were merely temporary. ldquo;The animals could, however, regain normal behavior for short periods of time if they were pinched.rdquo;What was in the 2,700-year-old marijuana stash? THC? CBD? Both?The archaeologists didnrsquo;t find much THC or CBD, but they did find a lot of another cannabinoid: cannabinol (CBN). Cannabinol isnrsquo;t normally found in large amounts in marijuana, but itrsquo;s produced over time as THC breaks down. This sample had been sitting around for a long while. So, given how much CBN was in the sample, the archaeologists figured that nearly three millennia ago this would have been premium, THC-rich weed.Second, the archaeologists also guessed that this high-octane herb had been carefully cultivated and harvested. They noted, for instance, that the seeds and leaves were all about the same size. (If it had been gathered from plants in the wild, there would have been much more variety.) They also found that the sample consisted entirely of buds from female plants, which are much higher in THC (i.e., marijuana that is known as sinsemilla). These plants had been selectively cultivated and harvested to maximize THC content in much the same way that growers do today.This study offers a third interesting result, but itrsquo;s one that the archaeologists donrsquo;t mention. Specifically, marijuana must have been very plentiful if people were willing to drop three quarters of a kilo of perfectly good pot into a grave.Sleepless in LondonSo humans have known for millennia that the ingredients of marijuanamdash;and particularly THCmdash;affect the brain. Of course, we donrsquo;t know what that

shaman used his marijuana for, and he certainly didnrsquo;t know what THC is, or what it does. Maybe he was trying to get to sleep, but it seems far more likely that he was looking for that stoned feeling of euphoria that THC also produces. In fact, it wasnrsquo;t until much later that we have a clear account of someonersquo;s attempt to harness THCrsquo;s effect on the brain to get a good nightrsquo;s sleep.In the 1840s there were many people with sleep disorders like Alicersquo;s who were trying to get a good nightrsquo;s sleep. One of them, Dr. John Clendinning, decided to do something about it.4Clendinning, a physician at Londonrsquo;s Marylebone Infirmary, wrote an article in which he describedmdash;and summarily dismissedmdash;a long list of other sleep aids, including prussic acid, henbane, belladonna, and aconite.Just in case you might be inspired to try these remedies (donrsquo;t), you should know that prussic acid is the old name for hydrogen cyanide. Henbane is Hyocyamus niger, also known as ldquo;stinking nightshade.rdquo; Belladonna is Atropa belladonna, or deadly nightshade. And ldquo;aconiterdquo; probably refers to plants in the genus Aconitum, which includes species such as wolfsbane, and which contain the toxin aconitine.Clendinning also mentions opium, which was the most popular choice at the time, but his criticism of the humble poppy was as unsparing as his criticism of prussic acid. Opium, he tell us, tends to produce ldquo;torpor in the stomach and bowelsrdquo; and it ldquo;deranges the hepatic and renal secretions.rdquo; These untoward effects, he adds, are particularly prominent ldquo;in nervous females, and dyspeptic subjects of either sex.rdquo;Fortunately, he suggests an alternative: marijuana.The centerpiece of Clendinningrsquo;s argument for marijuana is the case of a forty-four-year-old ldquo;medical man.rdquo; The individualrsquo;s identity is not divulged, although itrsquo;s worth noting that Clendinning was forty-five years old when his article was published. This coincidence, plus the inclusion of many personal details in his published report, makes it likely that the ldquo;medical manrdquo; who tried marijuana was the author himself.Clendinning used a tincture made from the resin of marijuana buds dissolved in a small amount of alcohol. To be specific, ldquo;Squirersquo;s tincture of Indian Hemp.rdquo; Hemdash;or, rather, this ldquo;medical manrdquo;mdash;used 12 minims (thatrsquo;s about one grain, or 60 milligrams).Perhaps that dose explains why Clendinning was delighted to report that this medical man finally enjoyed the effortless sleep that hersquo;d been seeking for years. On the first trial, he observed a ldquo;slight sense of confusion and fullness in the head, with some extra activity in the action of the carotid arteries.rdquo; Soon, though, he fell into ldquo;a slumber which lasted, uninterruptedly, for about six hours.rdquo; More important, he noted ldquo;none of the inconveniences which opium usually produced with him.rdquo;Despite these successes with Mechoulamrsquo;s rhesus monkeys and Dr. Clendinningrsquo;s experimenter, therersquo;s a dire shortage of randomized controlled trials proving marijuanarsquo;s value as a sleep aid, and the evidence that exists is mixed. Some studies have found benefits, while others havenrsquo;t.5There is some evidence that marijuana might help people like Alice get to sleep, but it appears in an unexpected place. Alicersquo;s friend tried using marijuana for joint pain and discovered that sleepiness was (for her) an unwanted side effect. It turns out that there have been several randomized controlled trials in which marijuana was used to treat pain and other symptoms in which people found that they were also able to sleep better.6There has also been a lot of experience with Sativex, which is a modern version of Clendinningrsquo;s tincture. Itrsquo;s a mix of THC and CBD dissolved in alcohol, used as a spray thatrsquo;s absorbed through the lining of the mouth. Although Sativex was developed initially to treat nausea, it seems to make sleeping easier for people with a variety of conditions ranging from cancer to multiple sclerosis.7Because those were studies of pain and other symptoms, we canrsquo;t say for sure that marijuana improves sleep. Itrsquo;s possiblemdash;even likelymdash;that the THC and CBD used in those studies reduced symptoms like pain or nausea that were interfering with patientsrsquo; sleep. So we donrsquo;t know whether marijuana can help people with sleep disorders.Nevertheless, based on the stories Irsquo;ve heard from all of the patients Irsquo;ve talked with, Irsquo;ll go out on a limb and say marijuana looks like a pretty good way to get to sleep, especially if yoursquo;re kept awake by pain or other symptoms. There are the usual cautions, of course. The dosage matters, and too much is likely to cause anxiety that will keep you awake. Therersquo;s also a risk of developing tolerance over time. Thatrsquo;s the finding of a study in which thirteen volunteers took THC by mouth on a schedule for seven days. Researchers found a small but significant reduction in sleep during that time.8Still, used in moderation, marijuana is probably effective in helping people get to sleep. Itrsquo;s probably at least as effective as other medication. And itrsquo;s certainly better than henbane.Corned Beef, Pastrami, and the Science of Cannabinoid ReceptorsHow the THC in marijuana might help people like Alice get a good nightrsquo;s sleep is a more complicated question, but itrsquo;s an important one, because the answer tells us a lot about how marijuana affects the brain. And knowing that will help us understand how it could be used to treat other symptoms like pain or nausea.If THC makes you sleepy, then yoursquo;d think that THC molecules must bind to receptors in the brain. And therersquo;s evidence that they do.9 Although itrsquo;s difficult to map receptors directly, we can look for the traces that remain after a receptor is made.Imagine that you walk into a deli and order a corned beef on rye. When you pay, you get a receipt. Then you hand the receipt in and you get your sandwich when itrsquo;s ready. When genes make proteins, including the proteins in THC receptors, they create a messenger genetic code known as RNA. Ribonucleic acid is essentially a summary of a gene, just like a receipt for that corned beef sandwich, and like that receipt it carries instructions from the DNA in genes (the cash register in this analogy) to the place in cells where THC receptors are made (the pickup window).Just as the deli owner can count receipts to figure out how many people are ordering corned beef compared

to pastrami, itrsquo;s possible to use messenger RNA to figure out what kind of receptors our cells are making. Itrsquo;s even possible to draw a map of where in the brain those receptors are.Researchers found a lot of those receipts for receptors were in the brainrsquo;s basal ganglia. That area works like a control center and helps to coordinate movement and balance so that movements happen in concert. Itrsquo;s what allows us to walk and talk and, normally, do both at the same time. It also contains a section thatrsquo;s responsible for ldquo;reward learning,rdquo; the process by which we associate actions and consequences.There are also lots of cannabinoid receptors in the limbic system, which is a loose collection of areas of the brain that sit beneath the outer cortex. Together, these areas are responsible for emotion and motivation, as well as memory. The hippocampus, which seems to be central in long-term memory formation, is also part of the limbic system.There are cannabinoid receptors in the cerebellum, too. The cerebellum sits in the back of the brain, as an offshoot of the spinal column. Indeed, it looks like a little spare brain, sticking out like a mushroom. Itrsquo;s responsible for coordination and balance, and especially the synthesis of the brainrsquo;s control of actions and sensory input from limbs. When you reach out to turn the page of a book, for instance, itrsquo;s the cerebellum that incorporates incoming information from your fingertips that tells you what yoursquo;re doing.Finally, there are cannabinoid receptors in other places in the brain, most notably in the cortex. This is the outer area of the brainmdash;the squiggly, bumpy pattern that wersquo;re most familiar with. The cortex is responsible for higher thought as well as the control of actions.These cannabinoid receptors appear in two types, called CB1 and CB2 receptors. The brainrsquo;s neurons, which do all of our thinking and feeling, have CB1 receptors. There are also some CB2 receptors in the brain, but they only appear on microglial cells. These cells arenrsquo;t responsible for thinking. Instead, theyrsquo;re the central nervous systemrsquo;s version of immune cells that clean up debris. So, if the THC in marijuana is going to help Alice get to sleep, it will probably do so by activating the CB1 receptors on neurons.The CB1 receptors that will help her get to sleep also appear in the reproductive system in men and women. They appear in the hormonal system, too, in the thyroid, pituitary, and adrenal glands. The CB2 receptors on the glial cells in the brain also seem to play a large role in the immune system. Theyrsquo;re particularly dense on two types of white blood cells, B lymphocytes and what are called natural killer cells, which are responsible for making antibodies and destroying foreign cells, respectively.10 Not surprisingly, there are also many CB2 receptors wherever there are a lot of immune cells, such as in the tonsils, thymus, and spleen and in the gastrointestinal tract.There are other cannabinoid receptors, too. Of these, perhaps the best studied are so-called vanilloid receptors, and one in particular, type 1, known as VR1. The VR1 receptor is basically a channel that lets cations (positively charged molecules like sodium) flow through the cell membrane. VR1 is particularly interesting because itrsquo;s nonspecific. That is, although it can be activated by THC, it can also be turned on by heat and capsaicin, the substance thatrsquo;s responsible for the spiciness of chili peppers.Wersquo;ll come back to these other receptors later, as we see how marijuana might treat symptoms and problems that exist outside the brain. The important point to remember for now is that the brain has a lot of cannabinoid receptors, and most of these are CB1 receptors that bind to THC. If wersquo;re hoping that marijuana will help people with sleep disorders get to sleep, itrsquo;s going to exert those effects mostly through THC.The Dragon of Narsquo;anIf CB1 and CB2 cannabinoid receptors are so widespread in the brain, marijuana might have other calming effects that could be useful. Irsquo;m thinking in particular about patients with dementia, who often become agitated and confused. Thatrsquo;s a problem for their caregivers, and especially for their families. To find out whether marijuana might calm an agitated patient with dementia, I go in search of a man who has been spreading the gospel of marijuana in a very unlikely place: nursing homes.I traveled to Tel Aviv to meet Zach Klein, a man who has administered medical marijuana to hundreds of nursing home residents with dementia and claimed success.On my way to meet him, I discover that if yoursquo;re looking for a bracing cure for the symptoms of a red-eye flight plus a seven-hour jet lag, nothing is quite as effective as a race through Tel Aviv at rush hour with a cabdriver who is blasting speed metal and singing along in Hebrew. I am now officially and irrevocably wide awake. Irsquo;m also a little unsteady on my feet as I climb out of our mobile concert hall, pay the lead singer, and stumble into an elegant restaurant.I donrsquo;t know what Zach Klein looks like, but he knows a jet-lagged traveler when he sees one. The man at the far side of the restaurant who gets up to greet me is tall, thin, and about my age. He sports a graying crew cut and long, broad sideburns that sweep down the sides of his face, making him look like an aging rockabilly singer.Klein isnrsquo;t a singer, though. Nor is he a doctor or a researcher. Hersquo;s a filmmaker who became interested in medical marijuana when his mother was diagnosed with cancer back in 2000.ldquo;Her oncologist told us, secretly, to get marijuana. It might help with the side effects of chemotherapy,rdquo; he said. ldquo;Nauseanbsp;.nbsp;.nbsp;. appetitenbsp;.nbsp;.nbsp;. sleepnbsp;.nbsp;.nbsp;. maybe pain.rdquo;But his mother was afraid of its effects on her brain.ldquo;You remember riggin?rdquo;I shake my head. Klein mimes with large, expressive hands, dropping a fist toward an upturned palm. ldquo;Your brainnbsp;.nbsp;.nbsp;.rdquo; The fist splays into a hand in midflight. Slap. ldquo;Your brain on drugs.rdquo;Ah. Kleinrsquo;s English is excellent, but his accent threw me. Reagan. Ronald Reagan and his war on drugs. Apparently that war had reached across the Atlantic to scare an old lady away from medical marijuana.There was someone Klein could turn to for advice. Raphael Mechoulam had recently won the Israel Prize, a coveted national award, for his marijuana research, and was giving public presentations of his work. Klein attended one of them and became

fascinated by all of the science involved. Fascinated, and a little confused.ldquo;It was so scientific,rdquo; he says, after a pause. ldquo;Where was the talk of Bob Marley? Of joints and bongs? Instead, it was all about molecules and receptors and experiments onnbsp;.nbsp;.nbsp;. mice.rdquo;After approaching Mechoulam at a lecture and receiving his personal assurance that marijuana was safe, Klein procured some for his mother. He saw how much better she felt after shersquo;d used it, and he became a convertmdash;and an evangelist.Klein explains that many people who were starting to use medical marijuana in Israel back then had no previous experience with it. So he became certified as an instructor to teach people about doses and side effects. Part of his responsibilities included rolling joints for his patients.Klein also did what any filmmaker would do when he was handed a story like this: he made a documentary for Israeli television (Prescribed Grass).That documentary was widely viewed and well received in Israel, but its most important result came a few months after it aired. Klein got a call from a nurse who worked in a nursing home at the Narsquo;an kibbutz (formally, Kibbutz Narsquo;an) near Tel Aviv. She wanted advice about one of her patients who had severe dementia. The patientrsquo;s family had received a marijuana license on the patientrsquo;s behalf, but the nurse didnrsquo;t know what to do. Legally, the patient could use marijuana, but she had dementia and couldnrsquo;t actually smoke a joint.Klein agreed to help, but when he visited the nursing home, what he found was daunting. This woman, his new pupil, was barely able to sit upright in a wheelchair, and had lost all ability to speak or understand. She would simply sit there, groaning.ldquo;She wouldnrsquo;t respond to anything,rdquo; Klein says. ldquo;So I asked the nurse if I could blow some smoke on her. Like this.rdquo; And he mimes taking a generous hit from a bong, and then slowly exhales imaginary marijuana smoke out toward the Mediterranean to his right.ldquo;It was amazing. She responded immediately,rdquo; he tells me. ldquo;This woman, shersquo;d been there for a few months, and shersquo;d never been calm and able to speak. Then she said her name, and she smiled for the first time.rdquo;He smiles, too, at the memory. ldquo;Then the nurse told me I had to stay there. She had thirty-six patients, she said. I should help them all.rdquo;They got additional licenses. Five, then ten, then more.Although thatrsquo;s a lot of smoking for one person, Klein tells me hersquo;s developed a tolerance. ldquo;Itrsquo;s like coffee. It just becomes part of your system. I came every day to smoke, and Irsquo;d visit the first patient, then the second, then the thirdnbsp;.nbsp;.nbsp;. They called me the dragon.rdquo;Irsquo;m glad that worked for him, and for the patients at Kibbutz Narsquo;an, but Irsquo;m having trouble imagining how that method could be exported. In the United States, for instance, inspectors would have conniptions if a ldquo;marijuana instructorrdquo; showed up at a nursing home, lit up, and started blowing smoke at patients. It didnrsquo;t take long, though, before someone in the kibbutz invented a Rube Goldbergndash;type contraption made of a glass flask, an aquarium pump, and plastic tubing. The marijuana burned and the pump pushed the resulting smoke through water and out into a balloon, from which the elderly patient inhaled. Apparently that was even more effective than Kleinrsquo;s secondhand smoke had been, and avoided what must have been a substantial occupational exposure for him.He says hersquo;s seen patients with severe dementia and limbs that are bent and immobile from disuse ldquo;open like a flower.rdquo; And hersquo;s seen patients with Parkinsonrsquo;s disease suddenly become able to write legibly. In fact, this becomes the final image in his documentary: a patient who told him to come back to film him because hersquo;d found that, with the help of marijuana, he could sign his name again for the first time in years.As Klein enthusiastically describes these successes while wersquo;re sitting in that cafeacute; in Tel Aviv, Irsquo;m impressed, but skeptical, too. These are just stories, not the results of careful studies. Maybe these patients, and Klein himself, were somehow just fooled into thinking that they were better?Then Klein tells me something that piques my curiosity. Not only did those patients feel better, they were able to stop some of the medications that they had been taking. Klein reviewed the charts of twenty-seven of his patients who started marijuana and found that they stopped a total of thirty-nine medications.He knows thatrsquo;s not proof of cause and effect. Maybe those patientsrsquo; physicians would have stopped their medications anyway, but he thinks marijuana had enough of a calming effect that some of those drugs were no longer needed.Klein tells me the Israeli Ministry of Health has since imposed several rules, such as a requirement that any marijuana be dispensed by a pharmacist, which were too expensive for his nursing home to follow. Now the home still honors its commitment to preexisting patients, but it doesnrsquo;t provide marijuana to any new patients. The nursing homersquo;s population is aging and dying, so the group of those who use it is shrinking.As we stand up to say good-bye, Klein tells me about an eleven-year-old boy with autism who started medical marijuana recently. It hasnrsquo;t cured his autism, but the boy is no longer shouting and hitting others, or himself. Hersquo;s also been able to go back to school with a private teacher. Irsquo;m not surprised by Kleinrsquo;s parting comment to me: ldquo;Irsquo;m making a documentary.rdquo;As Good as a Motorcycle Helmet?Irsquo;m very impressed by Kleinrsquo;s reports that his patients were able to stop some of their medications. Since the overuse of medications is such a problem in older people, especially in the United States, I wonder whether simply reducing medications might be of enormous value by itself. If Kleinrsquo;s patients were able to stop some medications and avoid some of those medicationsrsquo; side effects, that would be a benefit worth celebrating. A few days later I place a call to Dr. John Morley, the chief of geriatrics at Saint Louis University, and an advocate of medical marijuana for older people. Marijuana isnrsquo;t legal in Missouri, so he prescribes dronabinol, a synthetic form of THC thatrsquo;s available by prescription.ldquo;THC,rdquo; he tells me, ldquo;does exactly what you want it to do in older people with dementia

and behavioral disturbances.rdquo; Itrsquo;s calming, for instance, and he agrees with Dr. Clendinning that it can help people sleep.Morley also thinks it could have helped Kleinrsquo;s patients to stop some of their medications, particularly drugs like benzodiazepines or antipsychotics, which are often prescribed to help people sleep or to calm agitation; hersquo;s not surprised by Kleinrsquo;s results.He mentions that the ingredients of marijuana might have other beneficial effects on the brain, such as reducing the inflammation that leads to damage in conditions ranging from stroke to Alzheimerrsquo;s disease. Indeed, one study in rats has found that synthetic cannabinoids, including some that bind to the CB2 receptor, reduce the activity of the brainrsquo;s microglial cells. (As I mentioned earlier, these are the immune cells that clean up debris between brain cells.) That study also found CB1 and CB2 receptors buried in the plaques that are associated with Alzheimerrsquo;s disease.11 So I think itrsquo;s possible that marijuana might even have a role someday in the prevention or treatment of dementia.Marijuana might also give the brain some protection after a serious accident. Thatrsquo;s the preliminary conclusion of a study of 446 patients with a traumatic brain injury (for example, after a car accident or a fall).12 The patients with positive blood tests for THC had a mortality rate that was only about a quarter of what it was for patients who hadnrsquo;t been using marijuana. If that result is corroborated by future studies , it would mean that smoking a joint could improve your chances of survival in, say, a motorcycle accident as much as wearing a helmet does.Of course, any speculation about cause and effect would be premature as of this writing. Maybe marijuana users had less severe accidents, or maybe they were less likely to use more dangerous drugs. And, as wersquo;ll see later in the book, there are many other reasons why marijuana and driving donrsquo;t mix.Marijuanarsquo;s ingredients might even be used to treat someone who is having a stroke thatrsquo;s caused by a blockage of one of the brainrsquo;s arteries. In 2005, researchers did experiments on mice in which one of the brainrsquo;s arteries is blocked, which effectively cuts off oxygen to the brain cells that are served by that artery.13 They found that mice that had been given CBD had a smaller area of their brains affected, and less damage.As an interesting aside, cannabinoids might also protect against other neuronal damage. For instance, they might reduce the damage that occurs when rats are exposed to methamphetamines.14 That is, rats given the ingredients of marijuana and methamphetamine had less brain damage than those given methamphetamine alone.At first glance, that result seems counterintuitive. (And it certainly shouldnrsquo;t be taken as advice to use two illegal drugs.) How could marijuana protect against the damage caused by strokes or methamphetamines?One possible explanation from those studies is that the cannabinoids in marijuana reduce the activity of an enzyme called neuronal nitric oxide synthase. That enzyme produces nitric oxide, which is toxic to cells. So if cannabinoids reduce nitric oxide, injured cells may suffer less damage. Another possibility is that cannabinoids decrease inflammatory cytokines like tumor necrosis factor alpha, which is part of the bodyrsquo;s inflammatory response. In fact, itrsquo;s possible that both theories are true, and also that cannabinoids work through other mechanisms we havenrsquo;t discovered yet.These studies open up the intriguing possibility that cannabinoids such as THC and CBD might protect neurons that arenrsquo;t getting enough oxygen. Oxygen deprivation occurs during a stroke, and also during a cardiac arrest or a battlefield injury when therersquo;s been massive blood loss. That is why preliminary studies like these generate enthusiasm for cannabinoids and raise hopes that they might not merely treat symptoms, but might someday be used in treating or preventing disease.Don Quixote and Sancho PanzaIrsquo;m thinking back to something that John Morley the geriatrician told me. Marijuana isnrsquo;t legal where he practices medicine, so he uses dronabinol (a synthetic form of THC) as a substitute. He also told me about THCrsquo;s benefits, which he thinks are substantial.But what about cannabidiol? So far wersquo;ve seen only a few ways that CBD might be helpful. For instance, there was the study that found it might reduce the brain damage in mice after a stroke. But among all of the studies Irsquo;ve told you about so far, the star has been THC. In contrast, CBD seems to have only a supporting role.In fact, their relationship is a little like that of Don Quixote and Sancho Panza in Cervantesrsquo;s picaresque tale. The Don was a loopy aristocrat with odd delusions of chivalry and a skewed perception of reality that led himmdash;among other adventuresmdash;to imagine that a windmill was a giant against which he was honor-bound to battle. Sancho, on the other hand, was the humble servant, the practical, commonsense squire. He did his best to keep his master on the straight and narrow path, or at least to prevent him from doing too much harm to himself, or to windmills.You can think of THC as the Don Quixote of marijuanarsquo;s cannabinoids. Wersquo;ve seen how its receptors are scattered all over the brain, in the cortex, in the cerebellum, and in the reward centers, among other places. The fact that it binds to those widespread and diverse receptors means that it can make you goofy, confused, and even paranoid. Itrsquo;s responsible for the psychological effects that we associate with marijuana, such as euphoria and its ldquo;highrdquo; feeling. All those are the Quixotic effects of THC, and itrsquo;s because of all of its psychological effects that THC is the cannabinoid that everyone notices.Cannabidiol, on the other hand, is more like Sancho Panza. Whatrsquo;s most notable about CBD is what it doesnrsquo;t do. Specifically, it doesnrsquo;t produce any of the psychoactive effects of THC. It doesnrsquo;t make you feel high or paranoid, and it doesnrsquo;t make you hallucinate. Like Sancho Panza, CBD does whatever it does quietly and almost invisibly.CBD has a modulating effect. It tones down the bodyrsquo;smdash;and particularly the brainrsquo;smdash;natural responses to THC in the same way that Sancho restrained some of the Donrsquo;s most exuberant nuttiness.