

PRAISE FOR SYN BIO

“Blazing, well-drawn characters. Dynamite science of the gene manipulation and cyber techie sort. A gripping, twisting plot. Curious mysteries and international intrigue. From every angle, Leslie Alan Horvitz has created a masterpiece.”

—Dr. Janet Gilsdorf, author of *Ten Days* (Kensington Books)

SYN BIO

LESLIE ALAN HORVITZ

SynBio

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This is a work of fiction. Names, characters, places, and incidents either are the product of the author's imagination or are used fictitiously. Any resemblance to actual persons, living or dead, events, or locales is entirely coincidental.

Synthetic biology—synbio—is the next stage in biology. Genes, made out of DNA, have evolved over millions of years to have specific functions in their hosts, but now scientists are able to invent, rewrite, and rearrange the DNA code to create biological tools with specific uses never intended by nature, from treating diseases to manufacturing organic components programmed to target diseases and making diesel fuel from brewer's yeast to power cars. This new technology turns biology into pure engineering, where organisms can be treated like machines. Advances in synthetic biology will allow DNA hackers to personalize biology. They can manipulate genetic code using the equivalent of a word processor. With the press of a button, code representing DNA can be cut and pasted and effortlessly imported from one species into another. One day (probably sooner than later) we'll be able to search for a flu or cold vaccine and then download the "cure" via an app on a smart phone.

“In the future, politicians, celebrities, leaders of industry—just about anyone, really—could be vulnerable to attack-by-disease. Even if fatal, many such attacks could go undetected, mistaken for death by natural causes; many others would be difficult to pin on a suspect, especially given the passage of time between exposure and the appearance of symptoms.”

—Andrew Hessel, Marc Goodman, and Steven Kotler,
“Hacking the President’s DNA,” *Atlantic*, November 2012

“Not so long ago, people who provided DNA in the course of research studies were told that their privacy was assured . . . But geneticists nationwide have gotten a few rude awakenings, hints that research subjects in fact could sometimes be identified by their DNA alone, or even by the way their cells were using their DNA. The latest shock came in January, when a researcher at the Whitehead Institute, which is affiliated with the Massachusetts Institute of Technology, managed to track down five people selected at random from a database using only their DNA, ages and the states in which they lived. And he did it in just hours. He also found relatives—a total of close to 50 people.”

—Gina Kolata, “Poking Holes in Genetic Privacy,”
the New York Times, June 16, 2013

“Bio-crime today is akin to computer crime in the early 1980s. Few initially recognized the problem, but one need only observe how the threat grew exponentially over time.”

—Marc Goodman, security expert

“It is increasingly easy to order genes by mail. Something like smallpox is hard to get, but there are other organisms that could become harmful. If you change a living organism’s properties, you could also change its interactions with the environment or the human body. Scientists are notorious for not seeing the unintended consequences.”

—Helen Wallace, GeneWatch, UK

ONE

Washed-up, over the hill, lost his touch—he knew what they said about him. Old Marcus Adair doesn't have it anymore. For the people who looked down on him, who questioned him, who believed the allegations, he had nothing but contempt: he didn't care what they said; he was still in the game. He was still in Eddie's good graces and no one counted more than Eddie. While it was true that his reputation had taken some hits of late, he was nonetheless eagerly sought after on the lecture circuit. As a principal investigator for a global pharmaceutical firm—at least officially—he had nothing to be ashamed of, nothing to apologize for, nothing to hide . . . well, almost nothing. Those misguided critics, his wife among them, were just slow to understand.

Three to four million—that was how many differences generally separated one individual from another. Let's say four million differences between him and his wife—as far as he was concerned, the more of them, the better. Most of those differences were inconsequential, but find those differences that could predict that one person will have a long, healthy life and that another was going to have his life cut short by diabetes or cancer or Alzheimer's, and, well, that was a discovery to be patented and maybe there was a fortune to

be made. That was the marvelous thing about this work: you could know someone literally inside and out—and you could make money in the process.

Marcus didn't like the term *target*—too crass. Nor was the alternative—*victim*—any better since it connoted submissiveness, implied that the individual was undeserving of his fate. He preferred instead the term *designee*. It had a certain ambiguous distinction about it that appealed to him. Regrettably, while the genome for the designee in this case was difficult to acquire, it was possible to employ workarounds. The designee's relatives were easily identified and many of their genomes were accessible, legally or otherwise, in scores of DNA databases around the world. Marcus needed only five hours to create profiles of dozens of the designee's relations, uncles, aunts, cousins once-, twice-, and three times removed. It was a simple exercise, child's play really, a matter of using combinations of hundreds of thousands of DNA markers to reveal each relative's weight, age, and health plus their place of residence. He could tell whether someone was a diabetic, for instance, or whether he or she was infected with a virus like HIV—no secrets from Marcus Adair. Soon a pattern began to emerge: a surprising number of the designee's closest relatives carried the same potentially lethal variant: rs1333049. There was a reasonable possibility that the designee had this variant as well. Ordinarily, this variant, like so many others bestowed because of random mutations over generations, would have little or no impact; the individuals who'd inherited it would go to their graves finished off by some other cause: a pernicious infection or a car traveling in the wrong direction late one night.

But genes could be changed, synthesized, split, spliced, coded anew, inserted in places they didn't belong and removed from places they did. You didn't need to settle for the way things were. You could do a second or a third or a fourth draft of nature's program just as if you were revising a book over and over again. It was a different vocabulary, base pairs instead of letters or words or sentences—same idea, though. You just needed something to say.

Marcus had plenty to say.

*But I have heard of thee, that thou canst interpret obscure things,
and resolve difficult things: now if thou art able to read the writing,
and to show me the interpretation thereof, thou shalt be clothed with
purple . . . and shalt be the third prince in my kingdom.*

Marcus had never been much of a Bible reader, although there were certain parts of it that he regularly consulted for inspiration, if not for their moral lessons. He especially liked the Book of Daniel. He identified with Daniel. Like Daniel, he was an interpreter, albeit of DNA, not of dreams. If Daniel could discern the future of nations in dreams, Marcus could see the future of nations in genes. History could be manipulated, too, just like genes.

But when his heart was lifted up, and his spirit hardened unto pride, he was put down from the throne of his kingdom, and his glory was taken away. And he was driven out from the sons of men, and his heart was made like the beasts, and his dwelling was with the wild asses . . . till he knew that the most High ruled in the kingdom of men, and that he will set over it whomsoever it shall please him.

To prove to Eddie that he was capable, that there was no project too daunting for him, Marcus would need help. He'd have to recruit someone with an understanding of genes that was almost as deep as his. He already had someone in mind, but first that person would have to be put through some rigorous tests to prove that he had what it takes to bring down a king.

TWO

The Air France flight was an hour late getting into Paris. A major storm system over Northern Europe was to blame. The weather this winter had been worse than usual; the last time anyone had glimpsed a blue sky over the city was back in January. But then Eugenie Tattersall hadn't come to Paris to see the sights or to linger in outdoor cafes. She was here because of Mica Mandelbaum. He was enjoying the perks of first class while Eugenie had to settle for business class. For once she'd been unable to get herself upgraded.

The delayed arrival had given her extra time to bone up on her target's biography. It was always important to know more than she was likely to use—just in case. Mandelbaum, 54, boasted impressive educational credits: 1975, AB, Harvard College; 1978, MBA in Finance, Cornell University; 1982, MPhil in Economics, University of Oxford. Stints at the now defunct firms of Bear Sterns and Lehman Brothers hadn't hurt his prospects in government. He'd served as Assistant Secretary of Defense of Global Strategic Affairs, as a member of the Department of Defense Policy Board, with time off to serve as a policy advisor to then Governor George W. Bush during his first presidential campaign, before signing on as partner at a white shoe law firm

based in Washington—obviously someone who knew his way around the corridors of power.

He was on his second wife; he had three children, the oldest starting Oberlin; he collected homes and antiques; he patronized good causes; he was not immune to flattery. Also, and more pertinently, he had an eye for pretty women.

It wouldn't be necessary to seduce him (although that couldn't hurt), but it would be necessary to get close to him—very close.

Eugenie made sure that he spotted her in the shuttle bus and would easily be able to keep her in view inside the terminal at DeGaulle. The two men with him might look like they were colleagues but she could see that they were there to protect him from individuals who might pose a threat—people like her.

His plans were no secret—not from her employer anyway. He was staying at the Plaza Athenee on Avenue Montaigne. Tomorrow he would be attending the opening session of the Global Leadership Roundtable at the Mandarin Oriental. (The theme this year was “Stepping Back from the Abyss.”) She decided to make her approach that evening at his hotel, where he would be meeting a former French foreign minister for drinks before heading off to dinner.

Eugenie would have to figure out how she wished to introduce herself. It really depended on the sex and personality of the target. Sometimes it just depended on whim. She could be Ginny or Jenny or simply Jen. Her surname would change from one assignment to the next. Her job was one that required the skill of an actor and a talent for impersonation. She'd played a corporate executive, a *Financial Times* correspondent, a web developer, and a very high-priced call girl. Sometimes she forgot she was playing a role and then had trouble remembering who she was supposed to be.

But who was she supposed to be? It wasn't really clear to her. She'd grown up all over the world. She liked to tell people that her father was a diplomat, when in fact he'd been a failed businessman for whom the pastures were always greener elsewhere and who thought nothing of uprooting his family when a new opportunity beckoned in another time zone. Her mother pretended to be a dutiful wife and mother to her three kids. It was only when Eugenie was older that she realized that her mother had been rebelling all along by quietly taking on a new lover in whichever country she found herself. Eugenie had learned a great deal from her mother.

Eugenie had also been a rebel, although her rebellion took on different forms at different ages and in different cities. She was certain that she would

have been caught by the police far more frequently and served much longer sentences—none ever had lasted more than thirty days—if she hadn't been so attractive or so bright, so multilingual or so well educated. Still, she'd compiled a colorful record by the time she was in her early twenties. In Nice and Amsterdam she'd been arrested for smuggling drugs. In London it was for loitering with intention to solicit, something like that. In New York it was theft—furs, jewelry, designer jeans—possibly the most valuable criminal experience in that it offered good training for the kind of work she engaged in these days.

For the kind of work she did and the versatility she showed, she thought she should be better compensated, but she couldn't dispute the value of the perks, particularly the clothes: Prada, Dolce & Gabbana, Versace, Chanel, Valentino . . . whatever caught her fancy (although she didn't always get to keep everything they bought for her). Eddie could be very generous. But you could never tell where you stood with him. This evening's assignation demanded something stunning but not too formal or ostentatious; the décolleté should be sufficiently enticing without Mr. Mandelbaum's getting lost in it. The dress should look pricy and stylish without calling attention to itself. She decided on a perfume by Lancôme, which was made from passion flower, vanilla, and jasmine. It was called—one of the reasons she chose it—Hypnose.



The Relais was designed to convey the feeling of a grand old ocean liner with its cream leather seats, ruby red carpets, glittering chandeliers, and stained glass windows, although it lacked an ocean view. A pianist was plunking out tunes that Eugenie didn't recognize and couldn't say she liked. A generous gratuity ensured that she would be seated close to the table where the former foreign minister was already ensconced. She ordered a Chardonnay and told the waiter that she was expecting a friend. The restaurant was filling up with people, almost all of whom were decades older than she was, which was how she liked it. A few minutes later the target appeared.

Seeing her, Mandelbaum did a double take: I know her from somewhere, he was thinking, but where?

Mandelbaum and the minister fell into conversation about the Euro crisis (which bored her to tears) and currency manipulation on the part of the Chinese. From time to time Mandelbaum's eyes strayed over to her table. He was one of those men who liked to feel as if he were in charge and so he would have to think that he'd initiated the contact.

She made a point of frequently looking at her iPhone and glancing in the direction of the lobby as if in hope of spotting a friend—who, of course, didn't exist. She observed Mandelbaum's security detail lingering near the entrance. They didn't factor into her calculations. The kinds of threats they were on the alert for didn't include pretty girls alone at a table in a pricy Paris bistro. To be on the safe side, one of them snapped a picture of her, but she wasn't going to worry about it. She always made herself brand new for every assignment; in this case, the contact lenses (blue-green) and the wig (brunette) would help.

"Excuse me," Mandelbaum said, interrupting the minister and leaning toward her. "Didn't I see you at the airport this morning?"

So he'd finally managed to place her.

"I don't know, maybe. Were you on Air France flight 1681 from Heathrow?"

"It *was* you," he said with a note of satisfaction. "Are you waiting for someone?"

She confirmed what she'd spent the better part of an hour trying to make patently obvious. "He's really very late," she said, "I don't know what's keeping him." She held up her phone. "No message."

He offered to buy her another wine as compensation.

"I don't see why not."

The two men resumed their conversation. After another twenty minutes Mandelbaum asked for the check, signaling an end to the meeting. On the way out he paused at her table. "Hope your friend shows up soon. It's unconscionable that he would keep you waiting so long."

She wondered whether she'd overplayed her hand or misjudged the target. It happened but only rarely.

"Excuse me."

She glanced up. Mica Mandelbaum was back.

"Oh, hi," she said with a warm smile.

"I thought that since your friend doesn't look like he's going to show up you'd consider having dinner with me. I don't want to interfere with your plans."

You're the one whose plans I'm interfering with, she thought. But what she said was that she'd be happy to join him. "I need to teach the bastard a lesson," she said, hinting that dinner with a strange man might be the kind of retribution he deserved.

Then he introduced himself. She gave her name as Ginny. She held his hand in hers a beat longer than politeness required.

"Those men with you," she said, nodding toward the pair of bodyguards.

“Are they going to be joining us?”

“I don’t think there’s any harm in giving them the night off.”



It was just after one in the morning when Eugenie slipped out of Mica Mandelbaum’s suite, leaving him sound asleep. She assumed that her progress along the corridor would be monitored. There were surveillance cameras everywhere. But there would be no reason to suspect that she was anything other than an expensive call girl, surely not the only one invited to share the bed of a hotel guest. And she’d taken some precautions to thwart any facial recognition programs. Because the algorithms were usually based on a symmetrical look, she’d arranged her hair so that it fell over the left, but not right, side of her face, and because some algorithms relied on the nose bridge area as a key facial marker, she wore glasses that effectively concealed it. And if by chance Mandelbaum encountered her at some future time in another city he wouldn’t acknowledge her (in the unlikely event that he even recognized her). In any case, he’d have no reason to hold her responsible for anything. When he woke up in the morning he would find nothing missing. He would have just as much cash in his wallet as he had when he’d gone to bed, which might make him think that maybe she wasn’t a hooker, after all, but had simply slept with him because she was attracted to him. It would never occur to him that he’d been the victim of a theft, even though what was taken was worth considerably more than cash or valuables. Carefully cached in her red Hermes Birkin, and preserved in dry ice, was a used condom filled with Mica Mandelbaum’s drying sperm.

THREE

Seth Stringer had just come back from the FedEx office when he had the sense that he'd made a wrong turn—not geographically but in his life. He was suddenly filled with dread that he'd done something terribly wrong. The only problem was that he couldn't figure out what it was. After all, he routinely sent off genetic designs he'd constructed to biofabricators. It was essentially a matter of programming and editing, synthesizing and stitching. He seldom gave much thought to the uses to which the client would put them.

He tried to puzzle out what was making him so uneasy. Something to do with the gene protein he'd tweaked, PrPc, but what? Why would the client, a company previously unknown to him, want a variant that had no practical application?

Maybe if he hadn't been so distracted—maybe if he wasn't so distracted now—he'd have been more on top of things. By now he'd assumed he'd be himself again, but he'd begun to realize that it was going to take a while to regain his bearings. His father's death three weeks previously had been both devastating and a relief after a protracted illness. None of Seth's synthetic DNA, or any of the experimental drugs his clients produced, could have saved him.

And then there was the money.

The West Bridge bar in Kendall Square was nearly empty, but in an hour you wouldn't be able to find a seat. This was where researchers, techies, software engineers, and project managers working in offices and labs nearby came to unwind and hash over the day's imbroglios and small triumphs. The fate of the Bruins and the Celtics weighed heavily on them this time of the year. The prices deterred the majority of thirsty MIT students, who preferred cheaper hangouts like Flat Top Johnny's and Tommy Doyle's. He couldn't really afford it either, as Maggie never ceased to remind him. But he was here because he was hoping to see John Barbetto—ambush him was more like it.

Barbetto usually came into the West Bridge for happy hour. Seth had a plan. He would buy him a couple of drinks. They would talk about nothing in particular and then, when Seth sensed that he was in a susceptible mood, he would bring up the proposal. And then . . . and then Maggie would waltz in. That would be the clincher. Barbetto would give up any idea of leaving. He would be a captive audience. Maggie would see to that. Maggie was Seth's most formidable weapon.

Seth didn't need to wait long. John Barbetto looked like what he was: a venture capitalist. He was in his midthirties, close to Seth's age. He wore his prosperity lightly. He was getting thick around the waist, though.

Seth couldn't look desperate—that was a prescription for disaster. But he *was* desperate. Sooner or later he would have to tell Maggie that his savings were gone, devoured by his dad's medical bills. He'd never secure a deal if John believed he needed it badly. He had to convince John that he could walk away.

There was an instant when Barbetto's eyes found Seth that he seemed to flinch, but he stepped over to Seth, greeting him with his customary exuberance. "I didn't know you hung out here."

"Well, actually I'm meeting a friend," he said, and so there wouldn't be any misunderstanding, he added, "She should be here in half an hour or so."

"Oh?"

Seth hoped that he was curious enough to stick around. He asked Barbetto if he could buy him a drink, but Barbetto pulled out his wallet. "Let me get this." This was a first. Then he surprised Seth by expressing his condolences.

"I met your father once. At a conference in Chicago. He was delivering a talk on the Burgess Shale, about all those fossils they found on the sea floor with no known descendants. Your father believed that it was an experiment of evolution, like God was going through an experimental phase, throwing up new ideas and seeing what worked and what didn't—sink or swim. Your

father was a great man. It must have been hard to grow up in his shadow.”

Seth couldn't figure out whether this was a compliment or a put-down.

“I don't know whether you want to talk about your project now,” Barbetto said. “I know you've got so much else on your mind.”

“No, it's okay, I'm interested. What did you think?”

“Well, I've looked over your proposal and passed it on to some people who have expertise in the field. I wanted to get their take on the practicalities.”

“You understand that the process I'm proposing is similar in concept to 3-D printing?” Seth said, wondering who these experts were. “But instead of printing architectural models or tools you're printing out biological structures.”

John nodded absently. “Look, Seth, I love the idea of printing out cures; that you just download your prescription drug from your doctor's e-mail, print, and swallow it. It's fantastic, but maybe it's me. I just don't see it happening anytime soon.” He was quick to say that nothing was settled and if the experts were willing to sign off on it, and the numbers checked out, it was possible that they'd consider advancing some seed money. “Don't get discouraged. This happens with a lot of projects we're considering.”

Seth had to focus. Now wasn't the time to think about his debts. And it certainly wasn't time to think about the PrPc gene. “You know my track record.”

“Oh, your record is very impressive—everyone on my team agrees on that.”

“So you—and your team—should know that if I didn't think I could pull this off I wouldn't have approached you in the first place. I can guarantee you that this technology is going to happen . . .”

“I believe you, Seth.” The bar was beginning to fill up. Barbetto was looking toward the door.

Please, Maggie, come quickly. Seth was about to say something about getting in on the ground floor, but decided to let it go. John Barbetto and his partners were all about the ground floor. The ground floor was where they lived.

“The up-front money I'm asking for is pretty modest given the payoff.”

“Maybe you should have asked for more. My people can get spooked if you lowball the numbers.” He laughed uneasily. “That's a joke.”

And then Maggie, clever, sharp, pretty Maggie, walked through the door, right on time.

Seth stood up to welcome her. “John, I'd like to introduce you to a good friend of mine, Maggie Song.”

Her appearance immediately altered the dynamics. As Seth had

anticipated, John was charmed without their having exchanged a word.

“Maggie’s a biohacker, too,” Seth said.

“A part-time biohacker,” she corrected him. “I work with a nonprofit collective.” Groups of biohackers like BioCurious and the DIYBiology movement were committed to taking power away from big pharma, advancing the field of genetics in makeshift labs, using equipment that could be either jerry-rigged or bought on eBay for pennies on the dollar. It was garage biology. As such, it had a good deal in common with the college dropouts and inventors who assembled desktop computers out of salvaged parts at a time when IBM, Cray, and Wang dominated the industry. Seth had always felt like he was part of the movement, a contemporary version of a medieval guild, and he’d maintained this conviction even after he’d begun to work for the kinds of companies and organizations that Maggie disdained. He didn’t feel like he was a traitor. It was just that he didn’t feel like being poor, either. Actually, in her day job as a programmer for a prosperous software company on Boylston Street, Maggie was now doing better than he was. She insisted on getting the next round.

Suddenly Barbetto began to lavish praise on Seth, extolling the virtues of his proposal. He wanted to make a good impression on Maggie; it was so obvious it was laughable. But Seth’s mind was wandering

Maggie leaned closer to him and ran her hand over his back. Then she took over. She asked Barbetto what criteria his firm was looking for, why one start-up appealed to his team and another did not. She thought to ask questions that would never have occurred to Seth. “So what I don’t understand,” she said, “is why you’re still reluctant to commit to Seth’s project.”

Maggie could be so sure of herself sometimes that it was scary. She was a more ardent champion for his cause than he was. But then she had a vested interest in his success. What she didn’t know was how much Seth depended on this deal. If Sturbridge Partners didn’t come through, there was no way now that he could put up his share of the money for the loft on Binney Street that they were planning to buy. Sturbridge Partners could make the loft a realistic possibility for him, which would make Maggie a more realistic possibility, too.

Barbetto was suddenly defensive. Of course, Sturbridge was interested in Seth’s project. He didn’t want her to think otherwise. It was just that these things took time.

“I’m sorry,” she said. (She wasn’t sorry.) “I don’t mean to get on your case. But I feel so passionate about what Seth is doing, not because he’s such

a good friend.” She draped her arm over him as if to reinforce her words. “And not just because I have faith in him, but because what he’s doing could revolutionize the way that people can get their prescriptions. He’s giving them a tool that will allow them to take charge of their health.”

“We’re going to do a thorough review,” Barbetto said. He was too entranced by Maggie to pull himself away. He asked her if she had any projects that might be in need of a little seed money, too.

Seth smiled. He was trying hard to concentrate. But there was simply no room in his head. All he could think about was the PrPc gene. He had the same feeling that seized him whenever someone was too close behind him on a deserted street late at night. He was suddenly terrified. He knew exactly what he had done.

“Oh, shit!” Seth muttered.

They both gaped at him. “What is it, Seth?” Maggie asked.

“I’ve got to go. I’m sorry.” He shook Barbetto’s hand. “I just remembered something that I’ve got to do. Keep me posted about the proposal.”

He kissed Maggie, who was too startled to react. “I’ll call you later,” he said. He opened the door and stepped out into the rain.

Maybe it wasn’t too late. Maybe FedEx hadn’t sent out the package yet. It was only what?—an hour, an hour and a half? He was running. He was getting very wet. Kendall Square had practically disappeared in the murk. He almost collided with someone coming in the other direction. Curses followed him down the block.

Breathless and bedraggled, he burst into the FedEx office. He went up to the same clerk who’d taken the package. Seth was often here, so it wasn’t as if he were a stranger. He might be able to prevail on them. “I know this sounds nuts, and I don’t know about the protocol, but I was hoping that I could get back the package I gave you. I don’t care about the money. You don’t need to refund the payment.”

“I’m sorry, Mr. Stringer, there’s nothing I can do. The package has already gone out.”

FOUR

Number Nine was jammed tonight with the inevitable gym bunnies and hunks in tank tops and skinny jeans, with a scattering of suits and silver foxes, injecting a certain androgynous element into the mix. It was one of Washington, DC's most happening gay bars. Happy Hour extended until ten—Mojitos, Sidecars, Berry Coolers, and Lavender Lemon Drops included. The indie rock and electro put patrons in the mood to order another drink even before they'd finished the one in their hands.

Although the stylishly outfitted cocoa-skinned man could have had anyone he wanted, he seemed curiously indifferent to the overtures, subtle and overt, that he received. He was scrupulously polite. He told anyone who asked that his name was Max Samuels and that he was from the Islands, meaning the Caribbean. He had a refined, insinuating English accent that on its own could coax someone into his bed. (But where was his bed tonight? He wouldn't say.) He seemed perfectly content to sit alone in a booth, nursing a vodka and ginger ale. An observer would assume that he was waiting for someone special, no doubt a lover, but they would be only partially right:

the man he was waiting for was someone he'd never met, someone who didn't even realize that he was the object of Max Samuel's interest. Actually, that wasn't quite true. It was Eddie who was interested. Max was just doing Eddie's dirty work.

Max, who went by many names, identified Gary Galafaro from the photos he'd been given. He knew just about everything there was to know about Gary, although admittedly it wasn't very much because Gary's life to date hadn't been very eventful. He'd just turned 31. He was a graduate of William and Mary. He'd written a blog that had brought him to the attention of an assistant working in the White House press secretary's office, who'd gotten him hired. And while it was true that he was essentially a glorified errand boy—the lowest ranked employee in a staff of twenty—it was an extraordinary opportunity. He was eager to prove himself.

Gary wasn't bad looking. But under ordinary circumstances, he couldn't reasonably expect to meet a man like Max. Max was someone you admired—or desired—from afar, like a model or movie actor. He inhabited another universe and if he'd parachuted into the one that Gary knew, it was only because he was slumming.

Gary was flattered but utterly flummoxed to find Max standing next to him at the bar. He was dumbstruck when Max offered to buy him a drink. Men who'd been rebuffed by Max wondered what this unprepossessing, lowly White House staffer had that they didn't.

While Max asked Gary about his work and pretended an interest in what he was saying, he really didn't care. He was just making conversation. It wasn't part of his job to care. Secrets, in Max's experience, made someone interesting, and Gary had no secrets. Nonetheless, he was certain he would give Gary a night he would never forget—although it was hard to say what of it he would remember. The surreptitious introduction of a roofie into Gary's last Lavender Lemon Drop ensured that he would wake without knowing whether they'd had sex or not. Would he notice the tiny bruise where the needle had pierced his arm? Would he think back on this strange, incoherent night with a beautiful stranger when he began to develop abdominal pain or when his urine turned dark or his eyes took on a yellowish tinge? If he did, he would assume that he'd been infected because of unsafe sex. Why would anyone have deliberately given him Hepatitis B?

FIVE

You will never be invited to a dinner party at Seth Stringer's apartment. That's not because Seth is a recluse or doesn't like a good party—far from it. It's just that his guests would be hard pressed to find a place to squeeze in since his place is crammed full of equipment: PCR (short for polymerase chain reaction) instruments for synthesizing DNA, a microcentrifuge, a thermal cycler, a microwave oven, two fluorescent microscopes, a freezer, an ultrasonic bath, a gel electrophoresis, Tupperware boxes (for bacteria), a CO2 incubator, a pressure-cooker sterilizer, a bio printer, and too many micropipettes, tubes, small plastic vials, and off-the-shelf biological components to count. The resemblance to a meth lab, he insists, is purely coincidental. "My girlfriend and I are planning on getting a larger place sometime soon," Seth says, surveying the chaos of his apartment. Wouldn't she object to having a lab? "Oh, no, she's a biohacker, too." Seth laughs. "This is her world—she'll be right at home."

—Bryan Ellis, Wired Magazine

Seth didn't want to believe that he had sold his soul, although, as his father used to say, Faustian bargains were rarely made with a signature and a knowing nod from Mephistopheles, but rather happened bit by bit, incrementally, without your realizing that your soul had been hopelessly corroded, you'd made too many compromises, and there was no going back. He wondered whether his father had ever made compromises in the course of his long career.

He should have put two and two together. After all, he had a doctorate in bioinformatics, deriving algorithms intended to analyze biological data sets. And yet he'd totally missed a math problem that any child could have figured out, mainly because he hadn't understood that it was a problem at all. He had failed to make the connection between the enigmatic call he'd received a couple of weeks prior and the job he was asked to do for a company called Chrysalis.

He was distracted, so he didn't get the name of the caller or the name of the organization or company he was working for. "We're doing research for the U.S. government," the caller began. "We're focused on biological threats from rogue states and nonstate actors." Maybe he said his name was Silverstein or Silverman.

"We're contacting people like you who might be able to help us out. First, though, we need to ask you a few questions."

Seth told him to go ahead, but please make it quick because he was in the middle of something.

"We understand that you've been able to preset the time of expression of genetic functions in a predicable manner like an alarm clock."

"That's basically correct."

"And you've recently been developing a mechanism to cause cell death—what you call a 'time bomb'?"

"I'm sorry, I can't comment. I'm afraid that particular project was confidential."

"Tell me, Mr. Stringer, do you know anyone else in the biohacker community who might be trying to create new life forms at home?"

"I'm afraid you still haven't told me what this is about," he said.

"Thank you for your time, Mr. Stringer," Silverman or Silverstein said. "We'll be back to you shortly."

But Seth never heard from him. Now he wondered whether the call might not be related to the work Chrysalis Genomics had asked him to do involving variants of PrPc. He seldom thought about what a client would

ultimately do with his synthetic products. He considered himself more like a sculptor who was intent on realizing his vision in wood or stone or steel. The creation of art was its own justification.

What did he know about Chrysalis Genomics? They'd provided him with the material and information he'd requested. They paid promptly. His bank account had already been credited with the final installment even though they wouldn't receive the FedEx package until the next day.

Their website was uninformative, filled with jargon about "security and authentication solutions" to protect intellectual property from theft and fraud and "encrypted DNA markers."

He couldn't see how the work he'd done for them had any bearing on the kind of "solutions" they promoted, but that didn't mean anything really. Companies like Chrysalis were always branching out, exploring new avenues of research that they weren't prepared to advertise yet. They'd sent him an e-mail with a name of a contact person—one Jacob Bharwani—and a phone number if he had any questions. It was past two EST, too late for a call even with the three-hour difference. Mr. Bharwani would probably be asleep. Seth thought he'd leave a message anyhow.

He couldn't leave a message, though. The voice mailbox was full. This was unsettling. Was Mr. Bharwani on vacation? Wouldn't it behoove him or somebody in the company to find an employee to handle his calls if he was away? Seth went back to the website to see if he could find another phone number. There was none, only an e-mail address.

He was too wired to sleep. He had another drink. He did a search for Chrysalis. Maybe he should have done this earlier, but he had no reason at the time to perform due diligence, especially since the money had been so rapidly forthcoming.

What he discovered on a LISTSERV was hardly reassuring: In 2009 Chrysalis had been in the mail-order genetic testing business, offering information on ancestry and confirming paternity (or not), but critics called its results "misleading and of little or of no practical use to consumers." Had Chrysalis reinvented itself or had another company bought out the discredited entity and appropriated its name?

With dwindling hope he fired off an e-mail to Mr. Bharwani.

He didn't have to wait long for a response. It immediately bounced back—undeliverable.

Would it help to call his bank tomorrow and attempt to find out the account and issuer the checks had been drawn on? It was unlikely that he'd

learn anything. This was a company that seemed adept at covering its tracks.

He went back to his computer to reexamine his work, see if he might have made some mistake. Actually he hoped that he'd made a mistake, the more grievous the better. But to his disappointment he discovered that he'd fulfilled his assignment according to the specs. He had, in fact, done a superb job.

The PrPc prion gene was basically harmless and normally found on cell membranes. What he'd been paid to do was to turn it into a variant. Had he given any consideration to what the variant was or why he'd been asked to create one that revved up its biological activity? No, he was just doing what the job had called for.

But now he realized that the variant he'd unwittingly created was a dead ringer for PrPSc. It was the equivalent of turning Dr. Jekyll into Mr. Hyde. PrPSc was implicated in brain diseases like Creutzfeldt-Jakob, scrapie, and mad cow disease. It was a deadly infectious agent, mysterious, too, because it occupied its own pernicious taxonomic category, separate from viruses, bacteria, parasites, or fungi. The drug hadn't been invented that could slow or stop these things. Once unleashed, PrPSc would make mush out of neurons, ravaging the brain and riddling it full of holes. It was like dropping a frozen ice crystal into a bucket of water. After a while the rest of the water would freeze, too. The same thing would happen in your brain. You'd lose control over your motor functions, then bit by bit you'd lose your memory, forget who you were, forget where you belonged. Where you belonged would be with the dead.