"In this important work, Dreger reveals the shocking extent to which disciplines have been infested by mountebanks, poseurs, and worse, political activists who put ideology ahead of science."
—EDWARD O. WILSON

GALILEO'S MIDDLE FINGER

HERETICS, ACTIVISTS, AND ONE SCHOLAR'S SEARCH FOR JUSTICE

ALICE DREGER

INTRODUCTION

THE TALISMAN

SOON ENOUGH, I will get to the death threats, the sex charges, the alleged genocides, the epidemics, the alien abductees, the antilesbian drug, the unethical ethicists, the fight with Martina Navratilova, and of course, Galileo's middle finger. But first I have to tell you a little bit about how I got into this mess. And explain why I think we now have a very dangerous situation on our hands.

As an academic historian who typically hangs out with her own political kind, I'm aware of the stereotype many liberals have about conservative Catholics. The former believe the latter don't think—that conservative religious people don't care about facts and rigorous inquiry. But my conservative Catholic parents *were* thinkers. Twice as often as my parents told their four children to go wash, they told us to go look something up. At our suburban tract house on Long Island in the 1970s, our parents shelved the *Encyclopædia Britannica* right next to the dinner table so we could easily reach for a volume to settle the frequent debates. The rotating stack of periodicals in our kitchen included not only religiously oriented newsletters, but also the *New York Times* and *National Geographic*. Our parents took us to science museums, woke us up for lunar eclipses, and pushed us to question our textbooks and even our teachers when they sounded wrong. Although our mother never mentioned that she had earned a degree in philosophy from Hunter College, she read to us aloud from Plato and

Shakespeare, analyzing the texts as she read. Meanwhile, our father, a draftsman for one of the big Long Island defense contractors, loved learning in spite of having had only a high school education. We joked that he would someday be crushed under his books, most of them military histories of Poland, the homeland of both sides of our family. He got us microscopes and telescopes and talked seriously about the potential for alien life-forms. I vividly recall that, when one day we summoned him urgently to come see a giant UFO that had appeared in the sky, he was genuinely disappointed to discover he had bothered to grab his camera for the Goodyear blimp.

But besides being intellectuals and knowledge seekers, my parents were also industrial-strength Roman Catholics. They sought out Latin masses and avoided meat on Fridays long after Vatican II declared all that fuss unnecessary. They sent us to public school not only because the local public schools offered the best education around, but also because the local Catholic school struck them as dangerously liberal in its religious orientation. (Better to be among Protestants and Jews than roomfuls of squishy Catholics.) Their religious devotion manifested itself largely in pro-life activism. Even while their own children were still young and underfoot, my parents collected baby things to give to poor mothers, took in a young pregnant woman who had been thrown out by her parents, and became foster parents to a mixed-race baby of a single mother, ultimately adopting that child. As we were growing up, the basement of our house slowly filled with homemade placards we would carry when marching outside abortion clinics.

Although they were highly obedient to authority in their religious lives, in their political lives, my parents were rabble-rousers. My father ran for Congress on the Right-to-Life Party line, while my mother helped lead the local chapter of Feminists for Life. (In the 1970s, bra-burning pro-lifers were a real thing.) My mother especially embraced her American rights to speak, to assemble, to vote, and to protest, because she knew her life might well have turned out differently. Born in 1935 in Poland, she had somehow survived the Second World War

with her extended family in their tiny farming village in an area subjected to repeated aerial bombings and ground-war skirmishes. Not long after the war ended, at the age of eleven, she had been suddenly transported with her brother and mother to America, where the three of them were reunited with her father. (Her father had had dual citizenship and had fought with the Americans.) On these shores, she found a land where you could, *without fear*, say and think what you wanted, worship and vote as you wanted, and openly object to what you found stupid or offensive. She let us know, as we were growing up, that she considered American democracy a true wonder, a tool to be used at every chance. The Bill of Rights seemed to her almost as sacred as the Bible. This view was implicitly and explicitly reinforced by the rare relatives who made it out of Soviet-controlled Poland and came to lodge with us.

My parents never seemed to feel a tension between these heavy strands that comprised their lives—the Old World and the New, the religious and the intellectual, the obedient and the activist. I suppose that to them it all seemed obviously interrelated. They had no trouble sending me to confession one day and renewing my subscription to *Natural History* magazine the next. But as I grew up, I felt the tension one surely *must* feel when being simultaneously taught the importance of a specific dogma and the importance of freedom *from* dogma.

I knew that some people abandoned their parents' religion as a way of asserting their independence. But for me, losing my religion wasn't about rebellion against my parents; indeed, I felt quite forlorn at the idea of disappointing my family by admitting my atheism. Still, my parents' religious faith seemed to me incommensurate with our deeply felt faith in America—a faith in freedom of inquiry, in freedom of thought, in the will and right of the people to collectively discover truth and to make their own rules accordingly. And I loved America much more than I loved the Vatican, that place where celibate old men had the right to tell intelligent women what we should think and do. By the time I was in my late teens, while my sister was on her way to

becoming a nun, I couldn't help but notice that the place I felt the hope of salvation wasn't church. It was the American Museum of Natural History, that great cathedral of evolution. As often as I could, I would take the train into New York City and lie under the giant blue whale in the great darkened hall of ocean life. Every time I lay there—waiting for the delicious moment when the whale started to move, from optical illusion—science struck me as the obvious and perhaps only way to remain perpetually free from blinding, oppressive dogma.

I guess, then, it is not too surprising that I ultimately decided to pursue a PhD in the history and philosophy of science, at Indiana University. Exploring the very life and guts of science by studying the history and the philosophy of it—*this* seemed to me the way to make sure that the most antidogmatic way of life we had available to us, the scientific way of life, would remain healthy and vigorous. But by the time I moved to Bloomington for graduate school, in 1990, not everyone in the academic fields of science studies (the history, philosophy, and sociology of science) felt the same devotion. At that point, Marxist and feminist science-studies scholars had for almost two decades been producing a large body of work deeply critical of various scientific claims and practices. They had shown how various scientists had, in word and deed, oppressed women, people of color, and poor folks, typically by making problematic "scientific" claims about them. Harvard biologist Ruth Hubbard, for example, had taken apart pseudoscientific claims that biology made women "naturally" less capable of doing science than men. Historians like Londa Schiebinger and Cynthia Eagle Russett had documented how, over many centuries, patriarchies had deployed the rhetoric of science to represent women as inherently inferior to men. Meanwhile, Hubbard's Harvard colleague Stephen Jay Gould had scrutinized "scientific" studies purporting to show important racial differences in skull size and IQ and had shown them to be hopelessly riddled with racist bias.

Make no mistake: As a liberal feminist, I *was* extremely sympathetic to feminist and Marxist science studies. Indeed, the work of scholars

like Gould—whose columns in *Natural History* I had devoured as a teenager—struck me as constituting perhaps the most important work of social justice of our time, because it challenged racist and sexist claims about human nature. These leftist criticisms were part of what drove me to graduate school. But to me at least, the finding by Gould and others that scientists often suffered from bias didn't mean science *itself* was rotten. The very fact that scholars could *see and show* problems of racist and sexist bias in science stood to me as proof that, together, evidence-driven scholars could advance knowledge and ultimately get past the individual human mind's tendency to follow familiar scripts. If some of the products of science disappointed me, the process most assuredly did not. Indeed, in graduate school, I gravitated toward historical work specifically because I loved the relatively scientific process in history of seeking, organizing, and analyzing evidence—of letting the data guide you toward new and unexpected learning, as much as humanly possible.

IN GRADUATE SCHOOL, I ended up cutting my scholarly teeth on the history of the biomedical treatment of people born with sex anomalies—the people who used to be called hermaphrodites. For many years, people would assume I had a personal stake in this identity issue—that I or someone I loved had been born hermaphroditic—but in fact this topic was simply suggested to me by my dissertation director, who saw it as a great way to examine "scientific" conceptions of gender, something that fascinated me as a feminist. To be honest, in looking into the history of hermaphroditism, I decided to focus on the late nineteenth and early twentieth centuries because I figured I'd find easy pickings there. I already knew that most doctors of that time were politically conservative men, inclined to believe that the unequal social treatment of women arose from—nay, was *required* by—the allegedly natural two-sex divide. I knew there would have been a lot at stake for one of these sexist doctors when a patient appeared on inspection to

be a hermaphrodite. Some of these patients had immediately apparent mixes of male and female traits—a notable phallus and a vaginal opening or feminine breasts along with a full beard. Others appeared to have one sex externally but the opposite internally. All unwittingly challenged the idea that there were only two real sexes—that there was a clear, natural divide between men and women.

Just as I was finishing my PhD, in 1995, I published my first scholarly paper, in the journal *Victorian Studies*. This article mapped out a hitherto uncharted history: what Victorian British doctors had done when faced with living proof that humans don't come in only two sexes. Though my report contained some grainy 1890s photographs of ambiguous genitalia, it was still pretty academic, showing no real hint of the odd path the paper's publication would lead me down. My finding was simply that Victorian doctors, befuddled by cases of "doubtful sex," had deployed pragmatic combinations of clever rhetorical strategies, new scientific tools like microscopes, and the occasional surgical scalpel to try to make "true hermaphroditism" virtually disappear, all to protect long-standing social distinctions between men and women. But dry as that article may have been, it ended up pushing me into two unfamiliar and intense worlds: contemporary sex politics and contemporary medical activism. That's because, thanks to the Internet, by the time I came to this topic, in the mid-1990s, something was going on that the Victorian doctors would never have imagined: People who had been born with various sex anomalies had started to find each other, and they had started to organize as an identity rights movement.

Labeling themselves *intersex*, many gathered under the leadership of Bo Laurent, the founder of the Intersex Society of North America, and after reading my *Victorian Studies* article, some of these intersex activists, including Bo, contacted me. A couple wrote me simply to complain that they found some of my language offensive, apparently not realizing I was relaying Victorian rhetoric in my article. By contrast, Bo got my work. And she asked for my help in changing the way children born intersex were treated in modern medicine.

Now, as a straight, sex-typical female earning degrees in history and philosophy, I had started working in this field not only rather uneducated about human sex anatomy, but also rather uneducated about the politics of contemporary medicine. Still, it didn't take long for me to see the ways that our present-day medical system was indeed as broken as Bo and her compatriots were describing. Indeed, the system being employed at the children's hospital down the street from my grad-school apartment made the Victorian approach look relatively benign. The modern system featured not only highly aggressive cosmetic genital surgeries in infancy for children born with "socially inappropriate" genital variations like big clitorises, but also the withholding of diagnoses from patients and parents out of fear that they couldn't handle the truth. It treated boys born with small penises as hopeless cases who "had" to be castrated and sex-changed into girls, and it assumed that the ultimate ability of girls to reproduce as mothers should take precedence over all else, including the ability to someday experience orgasm.

I hastened to tell Bo, "I'm a historian; I study *dead* people." However, once I understood what was really going on at pediatric hospitals all over the nation—once I understood that Bo's clitoris had been amputated in the name of sex "normalcy" and that this practice was still going on—I felt I had to assist in her efforts. I had been raised to be an activist and to be someone who helps people in desperate circumstances, and I was stunned and outraged by what was going on. I threw myself into the struggle and spent the decade after grad school living two lives—as a professor researching and writing academic histories of the medical establishment's treatment of intersex and also as a patient advocate and a leading activist for the rights of sexual minorities. By day, I was your typical history professor—researching, teaching, and dealing with committee assignments. By night, I was campaigning to stop unnecessary and harmful genital surgeries, ill-advised sex changes on babies, and the well-meaning lies told to affected families. I held fund-raisers, I drafted press releases, I developed policies, I wrote and ghost-wrote propaganda, and I stuffed a lot of envelopes. I also testified

to governmental committees, met with groups of activists and doctors, got media training, and appeared as a talking head on one news program after another.

I found the advocacy work so meaningful and so exhausting that when it was time for me to go up for promotion to full professorship, I quit my day job instead. About ten years into my life as a PhD, I gave up tenure and the ability to grow my retirement account in part so that I would have more time and energy for activism. I also did it because by then I'd had a kid and couldn't continue to devote myself to two jobs; until I turned in my resignation letter, on top of my job as a professor, I was also managing our staff of five at the Intersex Society. At that point, I did let an old academic friend talk me into picking up a part-time, untenured professorship at Northwestern University's medical school in Chicago. The job there was small enough to leave me free to do whatever I felt needed my attention but big enough in name to open some doors.

IT WAS SHORTLY AFTER this time that I took on a new scholarly project, one that without much warning forced me to question my politics and my political loyalties, if not also my decision to give up tenure. This was a project that suddenly changed me from an activist going after establishment scientists into an aide-de-camp to scientists who found themselves the target of activists like me. Indeed, this project soon put me in a position I would never have imagined for myself: vilified by gender activists at the National Women's Studies Association meeting and then celebrated at the Human Behavior and Evolution Society by the enemies of my childhood hero, Stephen Jay Gould.

The scholarly project, which I took on early in 2006, involved investigating the history of one particular controversy over transgender. Just to be clear, although both transgender and intersex people are historically oppressed sexual minorities, transgender is different from intersex. Whereas *intersex* refers to the condition of being born with a mix

of female and male anatomical features, being *transgender* means feeling that the gender label assigned to you at birth was the wrong one. Think Christine Jorgensen or Chaz Bono, people who were born clearly one sex but who find they need to change it. To oversimplify it a bit, we could say that intersex is primarily about how you are born in terms of your sex organs, and transgender is primarily about how you feel in terms of your gender identity.

In 2003, three years before I came to the story, a group of transgender activists had kicked up a storm over a book by a Northwestern sex researcher, J. Michael Bailey, because in that book, Bailey had pushed a theory these activists didn't like: Bailey had suggested that, in cases of men who become women, transgender isn't just about gender identity, but also about sexual orientation—about eroticism. This, I already knew, was a no-no among certain groups of transgender activists who insisted that virtually all transgender people are born with the brain of one sex and the body of the other—that transgender identity is just about core inborn gender, not about erotic feelings. To opine about sexual orientation in conjunction with transgender the way Bailey did was to skip into a minefield created by four decades of intense social and medical battles over the nature of transgender identity.

Still, I thought I knew from my background in science studies and a decade of intersex work how to navigate an identity politics minefield, so I wasn't that worried when in 2006 I set out to investigate the history of what had really happened with Bailey and his critics. My investigation ballooned into a year of intensive research and a fifty-thousand-word peer-reviewed scholarly account of the controversy. And the results shocked me. Letting the data lead me, I uncovered a story that upended the simple narrative of power and oppression to which we leftist science studies scholars had become accustomed.

I found that, in the Bailey case, a small group had tried to bury a politically challenging scientific theory by killing the messenger. In the process of doing so, these critics, rather than restrict themselves to the argument over the ideas, had charged Bailey with a whole host of

serious crimes, including abusing the rights of subjects, having sex with a transsexual research subject, and making up data. The individuals making these charges—a trio of powerful transgender women, two of them situated in the safe house of liberal academia—had nearly ruined Bailey's reputation and his life. To do so, they had used some of the tactics we had used in the intersex rights movement: blanketing the Web to make sure they set the terms of debate, reaching out to politically sympathetic reporters to get the story into the press, doling out fresh information and new characters at a steady pace to keep the story in the media and to keep the pressure on, and rhetorically tapping into parallel left-leaning stories to make casual bystanders "get it" and care. Tracking their chosen techniques was occasionally like reading a how-to activist manual that I could have written, but there was one crucial difference: What they claimed about Bailey simply wasn't true.

You can probably guess what happens when you expose the unseemly deeds of people who fight dirty, particularly when you publish a meticulously documented journal article detailing exactly what they did, and especially when the *New York Times* covers what you found. Certainly I should have known what was coming—after all, I had literally written what amounted to a book on what this small group of activists had done to Bailey. But it was still pretty uncomfortable when I became the new target of their precise and unrelenting attacks. The online story soon morphed into "Alice Dreger versus the rights of sexual minorities," and no matter how hard I tried to point people back to documentation of the truth, facts just didn't seem to matter.

Troubled and confused by this ordeal, in 2008 I purposefully set out on a journey—or rather a series of journeys—that ended up lasting six years. During this time, I moved back and forth between camps of activists and camps of scientists, to try to understand what happens—and to figure out what *should* happen—when activists and scholars find themselves in conflict over critical matters of human identity. This book is the result.

I understand that some people on an exploration like this might

have tried to just clinically observe it all and to write an "objective" third-person account of scientific controversies over human identity in the Internet age. But already by the time I set out, I knew way too much about individual human bias to kid myself into thinking I could work simply as a stateless reporter above all the frays. I also felt too strongly the need to honor both good science and good activism to remain uninvolved when I saw crazy stuff happening on one side or the other. I believed—and still believe—too much in the importance of facts to sit idly by when I saw someone, be it a scientist or an activist, actively misrepresenting what is really known. As a consequence, as I traveled through scientist-activist wars over human identity—first in psychology, then anthropology, then prenatal pharmacology—rather than being merely embedded, I kept getting uncomfortably embroiled.

In spite of how difficult some of it has been, this journey of discovery proves something really important: Science and social justice require each other to be healthy, and both are critically important to human freedom. Without a just system, you cannot be free to do science, including science designed to better understand human identity; without science, and especially scientific understandings of human behaviors, you cannot know how to create a sustainably just system. As a consequence of this trip, I have come to understand that the pursuit of evidence is probably the most pressing moral imperative of our time. All of our work as scholars, activists, and citizens of democracy depends on it. Yet it seems that, especially where questions of human identity are concerned, we've built up a system in which scientists and social justice advocates are fighting in ways that poison the soil on which both depend. It's high time we think about this mess we've created, about what we're doing to each other and to democracy itself.

VERY OFTEN DURING this long, strange trip, while stuck in some airport on a layover, I found myself meditating on the image of Galileo's middle finger. I accidentally came upon that mummified digit

two decades ago on a trip in graduate school, just at the start of my scholarly work on the history of hermaphrodites. In May 1993, I had gone to Italy to accompany my mother, at her request, on a tour of Roman Catholic religious sites. As we had planned, when the tour ended, my mother flew back to America while I set off to continue around Europe by train to supplement my studies. For my first stop, I took the train from Rome to Florence to visit the history of science museum attached to the Uffizi art galleries. I had planned this short stop in Florence because of the opportunity to see the museum's collection of eighteenth-century wax obstetrical models, life-size teaching instruments I had already read much about. But I was also very excited at the prospect of seeing a set of artifacts that are to a historian of science what Jesus's cross would be to a Christian: Galileo's telescopes.

When Galileo Galilei was born, in 1564, the world had just started changing in the direction that would ultimately lead to modern science, modern technology, and democracy. The old way—accepting authorities without much question—had just started to develop serious cracks. Not long before Galileo's birth, European anatomists like Andreas Vesalius had begun to dissect human bodies and to show that the innards didn't always match what the ancient authorities like Galen described. A Polish scholar named Nicolaus Copernicus had crunched the astronomical numbers and in 1543 suggested a model contrary to the ancient astronomer Ptolemy's, a new model wherein the Sun, not the Earth, formed the center of our world.

But Galileo went much further than these men before him. Philosophically paving the way for the world as we now know it, Galileo actively argued for a bold new way of knowing, openly insisting that what mattered was not what the authorities—ancient or otherwise *said* was true but what anyone with the right tools could *show* was true. As no one before him had, he made the case for modern science—for finding truth together through the quest for facts.

Galileo's radical new way of thinking (along with his sense of humor) finds perfect display in one particular argument he had with a

colleague over a vital and timeless question from the physical sciences: whether you could cook a bird's egg by whirling it around your head in a sling. This hypothetical problem represented a larger physics question about whether flying objects heat up or cool down, but Galileo turned it into the even bigger question: How do we know if something is true?

Galileo's contemporary debate partner on this topic was a Jesuit scientist named Orazio Grassi. Like most people of his time, Grassi usually accepted the word of the ancient authorities, and because ancient authorities reported that the Babylonians had managed to cook eggs by twirling them about in a sling, Grassi figured it must be true. But Galileo mocked this silly claim and in so doing explained how one could personally *test* ideas about cause and effect by controlling for variables, a brilliant and remarkably modern idea. Weighing in on the problem, Galileo wrote:

> If we do not achieve an effect [like cooking an egg by whirling it] which others formerly achieved, it must be that in our operations we lack something which was the cause of this effect succeeding [for our predecessors], and if we lack but one single thing, then this alone can be the cause. Now we do not lack eggs, or slings, or sturdy fellows to whirl them; and still they do not cook, but rather they cool down faster if hot. And since nothing is lacking to us except being Babylonians, then being Babylonians [must be] the cause of the eggs hardening.

Of course what Galileo really meant was not that Babylonians had magical culinary skills, but this: Stop thinking that the authorities know what they're talking about when they're talking about natural causes and effects. Focus your mind on discoverable evidence.

Treating discernable facts as the ultimate authority, Galileo took to doing real experiments, dropping heavy balls down inclined planes to

study relative rates of fall, using careful quantification to find predictable, natural patterns in the world. When learned people around Galileo doubted Copernicus's idea that the earth is spinning and racing about the sun—because surely, if we were on a moving, turning planet, everything not tied down would be flying about—Galileo encouraged them to think harder. What happens, he asked them, when you drop a solid object while you are on a moving ship? The object falls straight *down* relative to you and the ship. He encouraged people to see this as real-life analogical *evidence* that could explain why a table not tied down moves *with* the earth's movement and does not fly off. He encouraged them to think beyond the taught or the "obvious," to *see for themselves* what was true.

In the spring of 1609, while living the life of a frustrated, underpaid university professor, Galileo heard about a brand-new optical device, the telescope. Ever the self-starter, he soon constructed one—and then a better one, and a better one. Others saw in this device military and commercial uses. (Ascertaining which trading ships were arriving when could provide advance knowledge of the markets.) But Galileo, engaging his radical epistemology of nature, turned his telescopes to the sky. And what did he see? Not at all the perfect geocentric heavens as they were described by the ancients and taught at the universities. No, indeed. The earth's moon had mountains. (A sign of imperfection in the heavens.) Jupiter had its own moons. (A sign that not everything orbited around the earth.) Venus had phases. (A sign of heliocentrism.) Throughout the sky, Galileo saw evidence of Copernicus's radical ne astronomical model.

Unafraid of these new facts and ever confident in his own genius, Galileo didn't even try to reconcile his findings with what the ancients had said. Instead he boldly reported his discoveries in a book he called *The Starry Messenger.* In it, he made a point of including careful drawings to show what the reader could verify with his own eyes if he could get his hands on a decent telescope.

Tempting as it is to see Galileo as supernatural, his surviving writ—

ings and the writings of those who knew him personally confirm his humanity for us; they paint him as alternately politically savvy and politically foolish, rash, self-destructive, funny, determined, and devoted to those he loved. And he was deeply human in one other important way: His science was almost certainly motivated, at least in part, by his personal beliefs. The mythical tales of Galileo told by artists like Bertolt Brecht hold him up as a scientific saint, someone who could see completely beyond himself. But as the biographer David Wootton has argued convincingly, Galileo was driven to defend Copernicanism in part because it satisfied his personal psychology: "If Galileo stuck with Copernicanism as the key topic he wanted to write about, it was because he was attracted by the idea of making human beings seem insignificant."

In the hands of Galileo, the telescope became a tool to investigate not only the stars, but also the human condition. He described a messy universe in which we humans are on just another whizzing planet—not a special, still place made for us by an attentive biblical God—and thus strayed dangerously close to the sorts of heretical ideas that had gotten his contemporary Giordano Bruno convicted of heresy. Bruno ended up burned at the stake for putting forth bold new visions of the universe. But Galileo—in spite of repeatedly attracting the attentions of the Inquisition, in spite of being legitimately scared of being subjected to imprisonment and torture and more—could not seem to stop himself from pursuing Copernicanism, from pursuing what he saw must be true about our vast universe, and especially about the rather negligible place of us humans in it. Moreover, he couldn't stop himself from promoting scientific truth in risky ways, even by making the pope look foolish.

This period is often considered the beginning of the Scientific Revolution, but you can see why that term doesn't really capture what Vesalius, Copernicus, Bruno, and especially Galileo were doing. What they were doing was much more radical: This was a revolution in *human identity*. This was not only a shift in ideas about what we can

know about the universe, but fundamentally a shift in what we can know *about ourselves.* This was a journey toward what finally became the Enlightenment. When Galileo rejected the Vatican's astronomical dogma, he wasn't rejecting only their "facts" about our planet and our sun; he was also rejecting the Church's right to tell us who we are. There's no doubt: The inquisitors were spot-on to see Galileo as extremely dangerous.

Nevertheless, although the Inquisition could arrest Galileo, it could not arrest human progress. The Scientific Revolution that swept through Europe was soon followed by democratic revolution. And all of these massive changes in science and in politics depended on a single central idea, one that Galileo held dear, the central idea of the Enlightenment: that we get to know for ourselves who we are, by seeking evidence, using reason, and coming to thoughtful consensus on truth. Science and democracy grew up together in Europe and North America, as twins; it is no coincidence that so many of America's Founding Fathers were science geeks. The "American" freedoms to think, to know, to learn, to speak—these were the freedoms that the radical Galileo had seized, long before they were finally written int our laws. As much as Thomas Jefferson and John Adams and Georg Washington, Galileo Galilei ultimately made our democracy possibl

THEREFORE IN MAY 1993, I expected that what Saint Peter's Bas ica would have been to my mother on our trip to Italy, the Florence museum room now containing Galileo's telescopes would be to me. As it turned out, however, I was lucky to get in to see the collection at all. A couple of days before I arrived, mafiosi had bombed the Uffizi, killing six people. In response, the entire city had gone on strike. When I alighted from the train, everything was still closed. Not sure what to do until my train left for Paris the next evening, I wandered over to the Basilica of Santa Croce—churches always stay open, of course--and spent some time admiring Galileo's magnificent tomb, the tomb they'd

built him about a hundred years after his death, when people had come to realize he had been right.

The next day, a few hours before I had to leave Florence, the part of the Uffizi that held the history of science collection opened. The docent handed me an English-language self-guided tour brochure, and I moved slowly from item to item, pausing especially to appreciate the evolution the telescope had enjoyed in Galileo's own hands. Eventually I came upon a strange object—a relic, like the religious relics my mother and I had just visited all over Italy, perched on an alabaster pillar, protected under a beautiful dome of glass. This, the guidebook explained, was Galileo's middle finger.

It seems that when Galileo's body was moved, a century after his death, from a too ordinary grave (the grave of a heretic) to the grand tomb in the basilica (the grave of a hero), a devotee chopped off Galileo's middle finger and arranged this little shrine. A fellow named Tommaso Perelli had provided a Latin inscription for the marble: "This is the finger, belonging to the illustrious hand that ran through the skies, pointing at the immense spaces, and singling out new stars, offering to the senses a marvelous apparatus of crafted glass, and with wise daring they could reach where neither Enceladus nor Tiphaeus ever reached." (In Greek mythology, Enceladus and Tiphaeus, aka Typhoeus or Typhon, were giants who stormed heaven and led a revolt against the Olympian gods, only to be thunderbolted and crushed under Mount Etna by Zeus.)

Now, I knew that in Italy sticking your middle finger up doesn't mean what it means in the United States. But the more I thought about it—about Galileo's contentious nature, his belief in the righteousness of science, his ego, his burning knowledge that he and Copernicus were *right*, and especially about what the Church had put him through—the more amusing the middle finger thrust skyward seemed. I mean, of all the remnants, how perfect is it that with his remaining relic, the old man is eternally flipping the universe the bird?

Eventually I couldn't stand it anymore. I just burst out laughing,

dropping the tour brochure on the floor. I picked it up and found the docent giving me a rather severe look. But I couldn't help myself. I started laughing uncontrollably again.

Somewhere on the crazy journey of the last few years, I stopped laughing at the image of Galileo's mummified middle finger and started thinking of it as a personal talisman. I would contemplate it to remind myself of certain propositions: That the mythical Galileo, a perfect man who could see beyond his own needs and his own psychology, never really lived—that uncomplicated heroes don't exist among the living. That all of us are struggling with the question of who we are. That sometimes people put you under house arrest because they honestly believe it is for the greater good. That it can be very hard in a moment of heated debate to tell who is right—it can take a hundred years and a thousand people to sort it out. As one person trying to get it right, sometimes the best you can do—the *most* you can do—is point to the sky, turn to the guy next to you, and ask, "Are you seeing what I'm seeing?"