

CHAPTER I

Agnotology

A Missing Term to Describe the Cultural Production of Ignorance (and Its Study)

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We are often unaware of the scope and structure of our ignorance. Ignorance is not just a blank space on a person's mental map. It has contours and coherence, and for all I know rules of operation as well. So as a corollary to writing about what we know, maybe we should add getting familiar with our ignorance.

Thomas Pynchon, 1984

Doubt is our product.

Brown & Williamson Tobacco Company, internal memo, 1969

PHILOSOPHERS LOVE TO TALK ABOUT KNOWLEDGE. A whole field is devoted to reflection on the topic, with product tie-ins to professorships and weighty conferences. *Epistemology* is serious business, taught in academies the world over: there is "moral" and "social" epistemology, epistemology of the sacred, the closet, and the family. There is a Computational Epistemology Laboratory at the University of Waterloo, and a Center for Epistemology at the Free University in Amsterdam. A Google search turns up separate websites for "constructivist," "feminist," and "evolutionary" epistemology, of course, but also "libidinal," "android," "Quaker," "Internet," and (my favorite) "erotometaphysical" epistemology. Harvard offers a course in the field (without the erotometaphysical part), which (if we are to believe its website) explores the epistemic status of weighty claims like "the standard meter is 1 meter long" and "I am not a brain in a vat."¹ We seem to know a lot about knowledge.²

What is remarkable, though, is **how little we know about ignorance**.³ There is not even a well-known word for its study (though our hope is to

change that), no fancy conferences or polished websites. This is particularly remarkable, given (a) how much ignorance there is, (b) how many kinds there are, and (c) how consequential ignorance is in our lives.

The point of this volume is to argue that there is much, in fact, to know. Ignorance has many friends and enemies, and figures big in everything from trade association propaganda to military operations to slogans chanted at children. Lawyers think a lot about it, since it often surfaces in consumer product liability and tort litigation, where the question is often "Who knew what, and when?" Ignorance has many interesting surrogates and overlaps in myriad ways with—as it is generated by—*secrecy, stupidity, apathy, censorship, disinformation, faith, and forgetfulness*, all of which are science-twitched. Ignorance hides in the shadows of philosophy and is frowned upon in sociology, but it also pops up in a great deal of popular rhetoric: it's no excuse, it's what can't hurt you, it's bliss. Ignorance has a history and a complex political and sexual geography, and does a lot of other odd and arresting work that bears exploring.

And deploring—though we don't see inquiry in this area as necessarily having the goal of *rectification*. Ignorance is most commonly seen (or trivialized) in this way, as something in need of correction, a kind of natural absence or void where knowledge has not yet spread. As educators, of course, we are committed to spreading knowledge. But ignorance is more than a void—and not even always a bad thing. No one needs or wants to know everything all the time; and surely all of us know things we would rather others not know. A founding principle of liberal states is that omniscience can be dangerous, and that some things should be kept private. Rights to privacy are essentially a form of sanctioned ignorance: liberal governments are (supposed to be) barred from knowing everything; inquisitors must have warrants. Juries are also supposed to be kept ignorant, since knowledge can be a form of bias. There is virtuous ignorance, in the form of resistance to (or limits placed on) dangerous knowledge.⁴

The causes of ignorance are multiple and diverse. Not many people know that the biggest building in the world is a semi-secret facility built to produce explosive uranium-235, using enormous magnets, near a non-descript town in southern Ohio (Piketon); but that is for reasons that are different from why we don't know much about the origin of life, or any-

thing at all about time before the Big Bang circa 14 billion years ago. And there are many different ways not to know. Ignorance can be the flipside of memory, what we don't know because we have forgotten, parts of which can be restored by historical inquiries but most of which is forever lost. (And we often cannot say which.) Ignorance can be made or unmade, and science can be complicit in either process.

THE PURPOSE OF THE PRESENT VOLUME is programmatic, to begin a discussion of ignorance as more than the "not yet known" or the steadily retreating frontier. We need to think about the conscious, unconscious, and structural production of ignorance, its diverse causes and conformations, whether brought about by neglect, forgetfulness, myopia, extinction, secrecy, or suppression. The point is to question the *naturalness* of ignorance, its causes and its distribution. Why have so few Americans heard about the *Nakba*? Why did epidemiologists miss the high levels of pellagra among early-twentieth-century African Americans?⁵ How did World War I-era research into the reproductive effects of alcohol become "scientifically uninteresting"?⁶ Why have today's geneticists developed a "collective amnesia" about Francis Galton?⁷ Why do "we" (many men and surely fewer women) know so little about the clitoris (see Nancy Tuana, this volume), or laws of nature classified for national security, or indigenous abortifacients (see Londa Schiebinger, this volume), or the countless Xs or Ys or Zs that we cannot even name, given how low they fly under the radar?

Now, certain kinds of exploration require that we make distinctions; that is a reasonable first step into understanding. "Cutting up" and "dividing into parts" is implicit in the etymology of *scientia*, which derives from the proto-Indo-European *skein*, via the Latin *seco* and *scindo* (to cut), from which we get *scissors* and *schism*, *scat* and *skin*. There must be as many kinds of ignorance as of knowledge—perhaps more, given how scant is our knowledge compared to the vastness of our ignorance. And though distinctions such as these are somewhat arbitrary, I shall make three to begin the discussion: ignorance as *native state* (or resource), ignorance as *lost realm* (or selective choice), and ignorance as a deliberately engineered and *strategic ploy* (or active construct). There are of course other ways to divide this pie, and several of the contributors to this volume provide alternative taxonomies.

IGNORANCE AS NATIVE STATE

This may be the most common way that scientists think about our topic: ignorance is like Kansas, a great place to be from. Knowledge grows out of ignorance, as a flower from honest soil, but the direction of movement is pretty much one way. Here, though, ignorance can also be a *prompt* for knowledge, insofar as we are constantly striving to destroy it—fact by fact. Ignorance has both an ontogeny and a phylogeny: babies start out ignorant and slowly come to know the world; hominids have become sapient over millions of years from the happy accident of upright posture and not knowing what to do with our idle hands. (I personally favor the theory that bipedalism enabled us to "put things in quotes" with our newly freed fingers.)

Ignorance in this sense of a primitive or native state is something to be fought or overcome; we hope and plan for it to disappear over time, as knowledge triumphs over foolish superstition. Ignorance is not necessarily evil—it can be innocent (as knowledge can be sin). But it seems to be something we are all supposed to want to grow out of, to put behind us, in the process of generating (or acquiring) knowledge. Johannes Kepler in the sixteenth century had a rather brutal way of putting it: ignorance was "the mother who must die for science to be born."⁸

And foolish ignorance abounds. Jay Leno makes good sport interviewing people who don't know whether the Earth has one or two moons, or what day of the week Good Friday lands on. More serious is the fact that 52 percent of all Americans answer "yes" when asked whether "the earliest humans lived at the same time as the dinosaurs."⁹ Science educators (and all thinking people) worry about the fact that about half of all Americans believe the Earth is only 6,000 years old, among them several former and living presidents. Ronald Reagan once proclaimed in a televised speech that America was great "because it has never known slavery"; ignorance seems to know no bounds.

Ignorance in this sense of "native" or "originary" state implies a kind of deficit, caused by the naivete of youth or the faults of improper education—or the simple fact that here is a place where *knowledge has not yet penetrated*. Ignorance is compared to innocence or, in the secular variant, knowledge in its infancy, with ontogeny more or less recapitulating phylogeny.¹⁰ Scientists often cherish this kind of ignorance, using it as a prompt to inquiry. There is

the familiar grant application version: we know this and that but not yet this other thing—so fund me please! Fill this gaping hole (which also happens to be my pocketbook)! Less cynical renditions are familiar from the history of philosophy: Socrates taught that the truly wise are those who realize how little they know; knowledge of one's ignorance is a precondition for enlightenment. The modern twist has ignorance as something to be escaped but also as a kind of rejuvenating force, since it is only by asking the right questions—by knowing wherein fruitful (that is, eradicable) ignorance lies—that we can ever come to knowledge.¹¹ Creative intellects are ignorance experts: they know where it can be found, and how to make it go away.

Modernity gives this a greater sense of urgency, insofar as ignorance becomes a kind of *vacuum* or hollow space into which knowledge is pulled. Science rushes in to fill the void, or rushes out to greet the world, if we recall the birthing metaphor of Kepler. Psychoanalytics aside, we could give various names to this theory of ignorance. I have called it *native ignorance*, because the notion is of a kind of *infantile absence* by virtue of primitivity, a dearth or cavity that is rectified (filled) by growth or birth—though other metaphors are used. Light floods the darkness, keys are found to unlock locks, ignorance is washed away, teaching uplifts out of ignorance, which is thereby destroyed or chased, and so forth.¹²

Ignorance here is seen as a *resource*, or at least a spur or challenge or prompt: ignorance is needed to keep the wheels of science turning. New ignorance must forever be rustled up to feed the insatiable appetite of science. **The world's stock of ignorance is not being depleted, however, since (by wondrous fortune and hydra-like) two new questions arise for every one answered. Some veils of ignorance are pushed aside but others always pop up, saving us from the end of inquiry. This regenerative power of ignorance makes the scientific enterprise sustainable. The nightmare would be if we were somehow to run out of ignorance, idling the engines of knowledge production. We need ignorance to fuel our knowledge engines. Science is sustainable because ignorance proliferates, a triumph not foreseen by early champions of modernity.** Bacon and Descartes both envisioned a time in the not so distant future—perhaps within their own lifetimes—when all scientific problems would be solved—but later Moderns knew a good thing when they saw it, and how to keep it going.

A vast literature exists on how to escape from ignorance, including the recognition that learning often implies a process of "unlearning" (try any of the 542,000 Google hits for this term). But there is also the appreciation that the *distribution of ignorance is unequal*, hence the digital divide, remedialisms of various sorts, and so forth. Technologies can cause the proliferation of ignorance: "the public seems to be awakening to the fact that in the midst of the 'information' explosion, there has been an 'ignorance' explosion as well."¹³ Media analyst Sut Jhally in 1991 made headlines when he found that people were misinformed about the Gulf War in direct proportion to how much TV they had watched on the topic.¹⁴ Radio was early on criticized as a vehicle for propaganda (spreading ignorance, as was often said), and Walter Benjamin discussed the quaint idea from the 1920s that film could lead to a kind of dictatorship of the imagination, via an enforced railroading of the eye (versus the freedom purportedly allowed by static graphic arts).¹⁵ The Internet has certainly fostered the spread of fictions along with facts—as when South Africa's president Thabo Mbeki "during a late-night Internet surfing session" happened on, and became convinced by, a website challenging the view that HIV was the cause of AIDS.¹⁶ The president's views were later used to justify a slowdown in efforts to combat exposure to the virus.

Our interest here, though, is less in remediation than in what Nancy Tuana has called the "liberatory moment"—which brings us to a more subtle form of agnotology.

IGNORANCE AS LOST REALM, OR SELECTIVE CHOICE (OR PASSIVE CONSTRUCT)

This second variant recognizes that ignorance, like knowledge, has a political geography, prompting us to ask: Who knows not? And why not? Where is there ignorance and why? Like knowledge or wealth or poverty, ignorance has a face, a house, and a price: it is encouraged here and discouraged there from ten thousand accidents (and deliberations) of social fortune. It is less like a vacuum than a solid or shifting body—which travels through time and occupies space, runs roughshod over people or things, and often leaves a shadow. Who at Hiroshima did not know to leave the city that day, and turned into a shadow on the asphalt?

Part of the idea is that inquiry is always selective. We look *here* rather than *there*; we have the predator's fovea (versus the indiscriminate watchfulness of prey), and the decision to focus on *this* is therefore invariably a choice to ignore *that*. Ignorance is a product of inattention, and since we cannot study all things, some by necessity—almost all, in fact—must be left out. "A way of seeing is also a way of not seeing—a focus upon object A involves a neglect of object B."¹⁷ And the world is very big—much bigger than the world of Descartes and Bacon, with their hopes for an imminent finish to the project of science. A key question, then, is: how should we regard the "missing matter," knowledge not yet known? Is science more like the progressive illumination of a well-defined box, or does darkness grow as fast as the light?

Both images are common. Selectivity is often conceived as transient, evanescent, a kind of "noise" in the system or scatter about the line, with bias slowly being rectified. Science is like mowing your lawn: you can choose any place to start, but things end up looking pretty much the same. I was recently faced with a succinct (albeit unpleasant) version of this in a peer review of a grant proposal of mine to the National Science Foundation. This rather disgruntled hooded "peer" was unhappy with my request for funds to study the history of paleoanthropology, given my failure to recognize, as he or she put it, that science was biased "*only in the past, but not in the present.*" In this undialogic context I did not have the opportunity to respond to this wonderfully self-refuting chestnut, which soured as soon as it was uttered; I couldn't point out that errors often do languish, projects go unfunded, opportunities are lost, the dead do not spring back to life, and justice does not always prevail—even in science. This is a different sense of selectivity: that knowledge switched onto one track cannot always return to areas passed over; we don't always have the opportunity to correct old errors.¹⁸ Research lost is not just research delayed; it can also be forever marked or never recovered.

Londa Schiebinger describes a clear instance of agnotology of this sort in her essay for this volume. The background here is that for three or four centuries following the first transits of the Atlantic and circumnavigations of Africa, European monarchs and trading companies sent out ships in search of fame or fortune, conquering and colonizing but also capturing

knowledge and wealth from far-flung territories. Not all knowledge gained in the peripheries flowed back to the center, however. The passage was unequal in that only certain *kinds* of goods were imported, while others were ignored. Abortifacients in particular were excluded: African and European women knew many different ways to prevent childbirth, but these were judged irrelevant to the kind of knowledge/extraction projects favored by the colonizing Europeans. The potato was fine, as was quinine from the bark of the *Cinchona* tree (for malaria), but not the means by which (white) women might have prevented conception or caused abortion. European governments were trying to grow their populations and conquer new territories, for which they needed quinine but not the peacock flower (the abortifacient described by Sibylla Maria Merian in 1710). Methods of contraception or abortion were low on the list of priorities, and the plants used for such purposes by the indigenes were simply ignored.

It may well be that no *decision* was ever made to ignore or destroy such knowledge. It is not hard to imagine an "overdetermined" mix of deliberate and inadvertent neglect, though the boundary between these two is not always clear. The mechanisms involved in producing or maintaining ignorance can change over time, and once things are made unknown—by suppression or by apathy—they can often remain unknown without further effort. Once lost or destroyed, a document or a species or a culture does not spring back to life. **Diego de Landa must have known this when he burned the Mayan royal libraries at Mani on the Yucatan in 1562, defending this act of cultural vandalism with the argument that such codices contained only "superstitions and lies of the devil." This bridges into our next form of agnogenesis: the deliberate production of ignorance in the form of strategies to deceive.**

IGNORANCE AS STRATEGIC PLOY, OR ACTIVE CONSTRUCT

The focus here is on ignorance—or doubt or uncertainty—as something that is made, maintained, and manipulated by means of certain arts and sciences. The idea is one that easily lends itself to paranoia: namely, that certain people don't want you to know certain things, or will actively work to organize doubt or uncertainty or misinformation to help maintain (your) ignorance.

They know, and may or may not want you to know they know, but you are not to be privy to the secret. This is an idea insufficiently explored by philosophers, that ignorance should not be viewed as a simple omission or gap, but rather as an active production. Ignorance can be an actively engineered part of a deliberate plan. I'll begin with trade secrets, moving from there in the next three sections to tobacco agnotology, military secrecy, and the example of ignorance making (or maintenance) as moral resistance.

There have always been lots of reasons to keep things secret—for love, for war, for business, for every conceivable human desire or enterprise.²⁹ Thought itself, of course, is secret until expressed in perishable verbal form, or in the more durable medium of print or some other enduring mode of capture. Secrets are as old as human thought and perhaps older still, judging from the fantastic variety of animal techniques of deception, ranging from insect camouflage to predators stashing their prey to the myriad disguises of herbivores. Recall how the white underbellies of deer and most other ungulates help turn these animals into non-objects by canceling shadows.

Science and trade are often said to be (or forced) open, but secrecy plays an important role in both realms—think of peer review, or the jealous guarding of discoveries until publication. Science and industry are increasingly interwoven, with R&D pursued under cloaks of privacy to maintain some business advantage. Science even in the best of circumstances is "open" only under highly ritualized constraints. The point of confidential peer review, for example, is to guarantee objectivity—here a kind of balanced fairness—to allow one's peers to criticize without fear of recrimination. Blinded review comes at a cost, however, since it means that an author—the recipient of criticism in this instance—cannot "consider the source." Reviewers can also act without taking responsibility for their opinions, except insofar as an editor or grant officer takes this into account.³⁰ A similar weakness plagues Wikipedia-style publishing, though preservation of page histories makes it at least theoretically possible to minimize vandalism (the bigger problem here is the perpetual "balance of terror" produced on controversial topics such as intelligent design).

Scientific secrecy long predates peer review. Alchemy and astrology were often advertised as occult sciences, in the sense of harnessing dark powers but also of being practiced in the dark, hidden from view.³¹ The

two senses were intertwined, since the principles sought were supposed to lie behind or beyond ordinary kinds of knowledge that flourished in the light. Much of early modern science was also guild-like, insofar as "secrets of the trade" were taken for granted. Trade secrets were guarded to control access to a particular kind of technique, resource, ritual, or market. Much of the rhetoric of the so-called Scientific Revolution was directed toward eliminating secrecy, to open up practices to inspection—whence the omnipresent rhetorics of "light," "clarification," and eventually "enlightenment." Alchemy done in the light became chemistry.

Trade secrets are still a vital part of manufacturing,²² however, and it is probably not far from the mark to say that older forms of secrecy have simply been replaced by newer ones. A great deal of modern chemistry is tied up with industrial production, making it hard to speak of an open exchange of ideas. Three or four people are supposed to know the formula for Coca-Cola, locked in a vault in Atlanta; the same is true for the spices used in Kentucky Fried Chicken (in Louisville) and many other celebrated consumables.²³ Publication is one way of claiming intellectual property, but ideas are also often shared "openly" only within some restricted social space. Military technologies are an obvious example, but there is a great deal of private speech inside law firms, hospitals, governments, and every other kind of institution, for whom knowledge is not just power but *danger*—which is why institutional amnesia may be as valued as institutional memory. Within academia, scholars will often keep certain ideas secret or limit their circulation to avoid improper use; and it is only after publication that circulation becomes difficult to control. Information flows are also limited for legal or PR purposes, or for reasons of national security. The apparent free flow of ideas celebrated in academia is actually circumscribed by the things that make it onto the public table; I taught at Pennsylvania State University for almost a dozen years before I stumbled onto a department called "Undersea Warfare," which is also about how long it took for me to learn that Penn State was the official university of the United States Marine Corps. I don't know how many of my former colleagues were aware of either of these closely held facts.

But there are other ways ignorance is crafted, and one of the most dramatic examples stems from the black arts of tobacco manufacturers.

Tobacco Industry Agnotology

One of my favorite examples of *agnogenesis* is the tobacco industry's efforts to manufacture doubt about the hazards of smoking. It was primarily in this context (along with military secrecy) that I first began exploring this idea of manufactured ignorance,²⁴ the question again being "Why don't we know what we don't know?" The none-too-complex answer in many instances was "because steps have been taken to keep you in the dark!" We rule you, if we can fool you. No one has done this more effectively than the tobacco mongers, the masters of fomenting ignorance to combat knowledge. Health fears are assuaged by reassurances in the form of "reasonable doubt"—a state of mind with both PR and legal value. The logic is simple, but it also has some devious twists and turns. I'll deal here only with the U.S. case, though the duplicity project is now being franchised globally to buttress the continued sale of 5.7 trillion cigarettes per annum, enough to circle the Earth some 13,000 times.

Marketing has always involved a certain persuasion bordering on deception, insofar as laundry soap is pretty much the same throughout the world. The tobacco industry early on recognized health concerns as market impediments, which is why L&M Filters were offered as "just what the doctor ordered," Camels were said to be smoked by "more doctors," and so forth. The industry was barred from making such claims in the 1950s and moved to more subtle inducements, associating smoking with youth, vigor, and beauty, and later freedom, risk, and rebellion. For a time in the 1980s, when health infringements centered around secondhand smoke, we were told that smoking was a form of free speech. The industry likes to have it both ways: smoking is patriotic yet rebellious, risky yet safe, calming yet exciting, and so forth.

Marketing tools of a novel sort were introduced in the early 1950s, following the explosion of evidence that cigarettes were killing tens of thousands every year. Responding to this evidence, the industry launched a multimillion dollar campaign to reassure consumers that the hazard had not yet been "proven." Through press releases, advertisements, and well-funded industry research fronts, epidemiology was denounced as "mere statistics," animal experiments were said not to reflect the human condition, and lung pathologies revealed at autopsy were derided as anecdotes without "sound

science" as backing. Cigarette manufacturers often invoked the laboratory as the site where the "controversy" would be resolved, knowing that it was difficult to mimic human smoking harms using animal models. Small animals just don't contract cancer from breathing smoke; it takes twenty or thirty or more years for human smokers to develop cancer, and rats don't live that long. And even when cancers were successfully produced in mice (by painting tobacco tars on their shaven backs), the industry admitted only the presence of "mouse carcinogens" in smoke. Cigarette apologists worked in a conveniently tight logical circle: no evidence was good enough, no experiment close enough to the human condition. True proof was hard to have short of experimenting on humans—but do you really want us to experiment on humans? What are you, some kind of Nazi?

We don't yet know what evil genius came up with the scheme to associate the continued manufacture of cigarettes with prudence, using the call for "more research" to slow the threat of regulation, but it must rank as one of the greatest triumphs of American corporate connivance.²⁵ The idea was that people would continue to smoke so long as they could be reassured that "no one really knows" the true cause of cancer. The strategy was to question all assertions to the contrary, all efforts to "close" the controversy, as if closure itself were a mark of dogma, the enemy of inquiry. The point was to keep the question of health harms open, for decades if possible. Cancer after all was a complex disease with multiple causes, all of which would have to be explored without rushing to any kind of judgment. We owed as much to those poor souls suffering from this terrible scourge, we had to keep an open mind, leaving the question of causation open. Do you want to close down research? Can't you keep an open mind?

Establishing and maintaining "the tobacco controversy" was a key element in the industry's PR strategy from the beginnings of the modern conspiracy in the 1950s. Controversy was like hope, something you (they) wanted to keep alive. Interminable controversy had an immediate value in keeping smokers smoking and legislators pliable. It eventually also had a legal value, insofar as the industry could claim it had never *denied* the hazards, but had only called for further evidence. The idea of "no proof" becomes one of the two main pillars of the industry's defense against lawsuits, the other being *common knowledge*: everyone has always known

about the dangers, so smokers have only themselves to blame for whatever illnesses they may contract. *Universal awareness* was matched with *open controversy*: everyone *knew* that cigarettes are harmful, but no one had ever *proven* it.²⁶

The strategy is a clever one, though it does require that we adopt a rather broad rift between popular and scientific knowledge. In court, the industry's experts do some fancy dancing to make this work, pointing to historical examples of "folk" wisdom predating scientific knowledge, with more "cautious" confirmations coming only later. Folk healers use an herb to effect a cure, but it takes some time for doctors to accept this and grasp how it works. So while *popular* belief may recognize that tobacco is hazardous, the *science* has been much harder to nail down. In court, the industry's experts like to emphasize the continuance of "legitimate scientific doubt" long past even the Surgeon General's report of 1964. Kenneth Ludmerer, a St. Louis medical historian and frequent witness for the industry, recently claimed under cross-examination that there was "room for responsible disagreement" with the hazards consensus even after the Surgeon General's report. Indeed, he says, "There's always room for disagreement."²⁷

A crucial issue in many lawsuits is whether the industry acted responsibly in denying any proof of a hazard. "Common knowledge" and "open controversy" come to the rescue, the hoped-for point being that since everyone has always known that cigarettes are dangerous, the manufacturers can't be faulted for failing to warn. The establishment of controversy in the scientific community is also crucial, though, because it gives cigarette makers yet another excuse for negligence in failing to warn. Why did the industry not warn smokers of a hazard? Because the issue had not been settled! No proof was forthcoming—so the industry maintained, duplicitously²⁸—so we cannot say it acted irresponsibly.²⁹

The tobacco industry was rarely innocent in any of these respects, since its goal at many points was to *generate* ignorance—or sometimes false knowledge—concerning tobacco's impact on health. The industry was trebly active in this sphere, feigning its *own* ignorance of hazards, while simultaneously affirming the *absence of definite proof* in the scientific community, while also doing all it could to *manufacture ignorance*

on the part of the smoking public. This last-mentioned goal was achieved by many different means, including release of duplicitous press releases, publication of "nobody knows the answers" white papers, and funding decoy or red-herring research to distract from genuine hazards (which also functioned as "alibi research" in subsequent litigation). Common knowledge was really only a legal arguing point—the reality desired by the industry was common ignorance (to keep people smoking). "Smoke-screen" is an appropriate epithet, but we could also talk about disestablishing facts, via several key strategies.

One was simply to conceal whatever hazards the industry knew about, but another was to fund research that would seem to be addressing tobacco and health, while really doing nothing of the sort. The chief instrument for this was the Tobacco Industry Research Council (TIRC), established in 1954 with great fanfare in full-page ads published in 448 of the nation's leading newspapers. The TIRC (later renamed the Council for Tobacco Research) eventually funded hundreds of millions of dollars of research, very little of which had anything to do with smoking. Little of it ever addressed the question supposedly in doubt: whether and to what extent cigarettes are bad for your health. The political value of research of this kind (mostly basic biochemistry) was the *fact of its being funded*—which allowed the industry to say it was "studying the problem." Industry researchers knew from the beginning what they were supposed to find (and not find): per instructions from the Tobacco Institute, the TIRC was supposed to manifest confidence that "we do not now know what causes lung cancer or any other kind of cancer."³⁰ Press releases and publications from the industry beat this drum pretty hard. In lawyerly fashion, health implications were thought of as "charges" to be refuted rather than as topics to be honestly investigated.

Yet another strategy was to publicize alternatives to the "cigarette theory." A key instrument in this was the already-mentioned Tobacco Institute, which metastasized from the TIRC in 1958 to serve as the lobbying and propaganda arm of the industry. For decades, the Tobacco Institute trumpeted the "no proof" position of the industry, usually in response to new confirmations of one or another tobacco hazard. The institute also published a monthly newsletter, the *Tobacco and Health Report*, draw-

ing attention to whatever could be used to distract from tobacco hazards. The magazine was sent to hundreds of thousands of physicians, plus thousands of other opinion makers from industry, government, and journalism, the purpose being to highlight every possible cause of cancer except for tobacco. Typical for 1963 and 1964 were articles with titles such as "Rare Fungus Infection Mimics Lung Cancer," "Viral Infections Blamed in Bronchitis Outbreaks," "English Surgeon Links Urbanization to Lung Cancer," "Nicotine Effect Is Like Exercise," "Lung Cancer Rare in Bald Men," "28 Reasons for Doubting Cigarette-Cancer Link," and "No One Yet Knows the Answers." The magazine blamed bird keeping (feather mites), genetics, viruses, air pollution, and every other possible cause of the lung cancer epidemic—except tobacco.

Throughout this period, the goal of the industry was to comfort by virtue of allying itself with science. One remarkable organ for this purpose was *Science Fortnightly*, an ambitious popular science magazine published by the Lorillard Tobacco Company from 1963 to 1965, mailed free of charge every two weeks to 1.4 million people. This was one of the best popular science publications of the decade, treating new archaeological finds, theories of the origins of the Earth, sociological questions about the role of blacks and women in science, and dozens of other hot topics. The point was to introduce a breath of fresh air to science reporting, including also in every issue a couple of large and serious ads for Kent's micronite filter, "made of a pure, dust-free, completely harmless material that is so safe that it is actually used to help filter the air in operating rooms of leading hospitals." That semi-secret "harmless material" for a time at least in the 1950s was crocidolite asbestos.

Cigarette makers were successful for a time in keeping many people in the dark about the magnitude of certain hazards. A Harris Poll of adults in 1966 found that not even half of those questioned regarded smoking as a "major" cause of lung cancer.³¹ Surveys conducted that same year for the U.S. Public Health Service found that only 46 percent of those polled answered "yes" when asked: "Is there any way at all to prevent a person from getting lung cancer?" Twenty percent of those answered "yes" in response to the same question about emphysema and chronic bronchitis.³² Thirteen- and fourteen-year-olds were not polled, but it would be surprising

if their awareness was any higher. Even today, how many people know that smoking is a major cause of blindness, bladder cancer, and cancers of the pancreas? Or (possibly) cancers of the human breast?³³ We need better measures of this and other kinds of ignorance—*agnotometric indicators* that will tell us how many people don't know X, Y, or Z.

A new element in the tobacco story over the past twenty years or so has been the industry's hiring of historians to tell the tobacco story in a way that jurors might find sympathetic. Historians are employed to point out that correlation does not imply causation, that history is messy, that we must be careful in judging the past, that good history may even require our *not* judging the past, and so forth.³⁴ Historians are most often brought into tobacco trials to testify to what is known as "state of the art" and "common knowledge"—basically the science of the times, and what people knew about the hazard. As of 2005 at least thirty-six academic historians had testified under oath for the industry—whereas only three had testified against (myself, Louis Kyriakoudes, and Allan Brandt).³⁵ The industry's goal has been to control the *history* of tobacco just as earlier they'd controlled the *science* of tobacco. A typical instrument in this was Philip Morris's "Project Cosmic," an effort launched in 1987 to create "an extensive network of scientists and historians from all over the world" to write the history of drug use.³⁶ David Musto of Yale, David Harley of Oxford, John Burnham of Ohio State, and a number of others were approached to write articles for the industry to "see to it that the beneficial effects of nicotine are more widely understood."³⁷ Musto's work was considered particularly useful for presenting "a moderate view of substance use in the media."³⁸ Hundreds of thousands of dollars were paid to Cosmic research directors; Musto alone received nearly \$500,000.³⁹ Grantees published on the history of tobacco without ever acknowledging the industry's support. David Harley, for example, published an article on "The Beginnings of the Tobacco Controversy" in the *Bulletin of the History of Medicine*, thanking a certain Daniel Ennis for "encouraging my interest in this topic."⁴⁰ Nowhere does he mention that Ennis's "encouragement" took the form of large piles of cash from Philip Morris.

There is an interesting sense in which the most common definitions of expertise in recent tobacco trials are biased in favor of the defense. Biased,

because in restricting their focus to the "state of the art," a historian might fail to recognize the "state of the deception." **If there is a diversity of views on tobacco as a cause of cancer, what fraction of that diversity has been created by the industry itself?** Similar problems confront our grappling with the extent to which tobacco harms were "common knowledge." We need to know what people knew, but also what they didn't know (and why not). "Common ignorance" must be explored and understood as much as common knowledge.

Big Tobacco wants us to believe that there are really only two kinds of knowledge in question: popular and scientific. Ignored is the role of the industry itself in creating ignorance: via advertising, duplicitous press releases, funding of decoy research, establishment of scientific front organizations, manipulation of legislative agendas,⁴¹ organization of "friendly research" for publication in popular magazines, and myriad additional projects from the dark arts of agnotology. Tremendous amounts of money have been thrown into this effort, which the industry's own lawyers have (privately) characterized as a form of "studied ignorance."⁴² The industry eventually recognized itself as a manufacturer of two separate, but codependent products: cigarettes and *doubt*. As Tobacco Institute VP Fred Panzer put it in a 1971 memo, the industry's goal was to create "doubt about the health charge without actually denying it."⁴³ Brown & Williamson officials had earlier confessed (internally) that "doubt is our product,"⁴⁴ and in the 1980s Philip Morris responded to the "threat" of environmental tobacco smoke (ETS) by formulating as their number one "strategy objective": "to maintain doubt on the scientific front about ETS."⁴⁵

There is no central tenet in tobacco industry agnotology, however; their philosophy is opportunistic, and always subordinate to the goal of selling cigarettes and winning lawsuits, usually via stalling tactics known in the business as "sand in the gears."⁴⁶ Cigaretteers will jump from being Popperian to constructivist as it suits them; they love to argue that no number of experiments can verify a theory, but they also know how to hammer away at the language of a claim until it falls to pieces. (Recall the Academy for Tobacco Studies' scientist in *Thank You for Smoking* who could "disprove gravity.") And on the question of demonstrating harms, the industry's standards for proof are so high that nothing in this world

could satisfy them. "More research" is always needed, a "benefit of the doubt" is always granted, as if cigarettes were on trial and innocent until proven guilty. The industry loves this form of the "null hypothesis": they start by assuming "no harm done," and then fail in their feeble efforts at falsification. Similar strategies have been used by other industries to disprove hazards of lead, asbestos, and the like; and petrochemical and neoconservative doubters of global warming have learned a lesson or two from the tobacco doubt mongers (as Naomi Oreskes shows in her contribution to this volume).⁴⁷

Military Secrecy

Tobacco duplicity is notorious, but deliberate ignorance also comes from numerous other sources, such as military classification. **Estimates are that a quarter of the world's technical personnel have some kind of military clearance; there are secret scientific facts, secret scientific methods, secret scientific societies, secret scientific journals, and (probably) secret laws of nature.** Military men don't always want to keep secrets from themselves, so firewalls are established to allow a community of cognoscenti with "clearance" to meet in private to discuss classified matters. The National Security Agency, for example, maintains an Internet firewalled from the outside world, as do some of our larger private corporations. The Manhattan Project in World War II (to make an atomic bomb) set the stage for much of America's postwar secret research; the project diverted much of the country's scientific talent and the name itself was a deception, as was Britain's comparable "Tube Alloys Project." Nuclear technologies have been clothed in secrecy from quite early on: the very existence of plutonium, for example, was classified for several years after its discovery, and words like "radiation" and "radioisotope" were not supposed to be bandied about. Neither word was mentioned in the first 200 articles written on the atom bomb.⁴⁸

Atomic secrecy was also the rationale for entire scientific disciplines going underground, with code names devised for sensitive topics. The field of "Health Physics," for example, has its origins in the need to explore the novel hazards of atomic radiation, with the name being deliberately kept vague to disguise the fact that projects were underway to explore health and safety in the nuclear workplace.

The whole point of secrecy in this realm is to hide, to feint, to distract, to deny access, and to monopolize information. Global positioning system locations are tweaked to keep "sensitive" locations (for example, the White House) unknowable—and so untargetable—and entire cities have been erased from maps or never drawn in. The National Security Agency is larger and more secretive even than the Central Intelligence Agency (NSA = "No Such Agency")⁴⁹ and the National Reconnaissance Office is more shadowy still, and even better funded. Most secret would be those offices and operations "we" in the outside world know nothing about. Classified research in the United States is hidden in the so-called Black Budget, which currently exceeds the amounts funded for education and many other social services. In November of 2005, Mary Margaret Graham, deputy director of National Intelligence at the CIA, revealed the total U.S. intelligence budget to be \$44 billion per annum.⁵⁰

The impact of military secrecy on science has been profound, affecting nearly every branch of knowledge. An interesting case concerns the seafloor stripes discovered during World War II. These large, linear, magnetic anomalies are caused by a combination of seafloor spreading and periodic reversals in the Earth's magnetic field. They were also useful in locating enemy German (and later Russian) submarines, assisting in the scanning for underwater metallic objects. Seafloor stripes were important in the acceptance of continental drift, but their locations and even their existence were classified until the 1950s. Had these been openly available to the scientific community, the theory of continental drift could have been accepted years before it was. Secrecy in this instance produced ignorance in the form of delayed knowledge.⁵¹

There are other examples of military agnogenesis. Military-sponsored research in the 1940s led to early predictions of global warming and the melting of the polar ice caps; the guardians of military secrecy kept this quiet, however, and the topic was not widely and openly discussed.⁵² Climate science has suffered new kinds of agnotology in recent years, as Bush administration strategists have tried to keep the question of anthropogenic global warming "open."⁵³ As with tobacco industry apologetics, calls for "more research" on climate change have served as an effective stalling tactic: the strong evidence of warming is denied, using the pretence

of a quest for rigor as a trick to delay action. Calls for precision can play out as prevarication.

Military research has more often generated ignorance by passive agnogenesis: we have many examples where military funding has pushed certain areas, leaving others to languish. Carbon-14 research, for example, was heavily supported by the military as part of nuclear isotope research (Libby's work), whereas oxygen isotope analysis languished underfunded. Science responds to funding opportunities, which means that ignorance can be maintained or created in certain areas simply by "defunding." When Ronald Reagan took office in 1980, federal funding for solar energy research was zeroed out. Semiconductor studies that could have advanced knowledge in this realm were transferred to areas such as the "hardening" of silicon chips to resist the neutron flux from an atomic blast. Solar technology "know-how" suffered from this loss of funding; ignorance here resulted from a decision to emphasize fossil fuels over renewable energy sources.

VIRTUOUS IGNORANCE? "NOT KNOWING"
AS RESISTANCE OR MORAL CAUTION

The prospect sounds anathema: how could anyone want to hold back the progress of science? Knowledge is the light; why bathe in the dark? Once past the bluster, however, there are obviously many things "we" don't want to know—and many more we'd rather have others not know about us. I've mentioned the "right to privacy," but there are other realms where "less is more" when it comes to knowledge, including scientific knowledge.

We know this from popular sayings, as in the notion that it is not always easy to put some genies "back in the bottle." Knowledge escapes, that we'd rather have confined or relegated to history. This would include many technologies and bodies of skill: if not those surrounding plutonium or uranium, then perhaps the know-how involved in torture, or the manufacture of neutron bombs, or some of our more horrific bioweapons. People can work to undo rotten knowledge; that is one goal of education, but it is also the principal rationale for military classification, in that powers that be don't want dangerous knowledge falling into the wrong hands.

Universities routinely bar many kinds of research—research with

strings attached, for example, or research that involves certain kinds of risks for human or animal subjects, or research of a sort intended solely for profit, and so forth. Many universities bar research that is classified for military purposes, along with research seen to involve certain kinds of conflict of interest. UCSF's Energy Institute won't take money from oil and gas interests, for example, and many universities have been struggling over whether to allow projects funded by the tobacco industry. Rationales for such restrictions differ in each instance, but one overarching theory is that certain kinds of research will produce knowledge that could be biased or undesirable.

Scientific journals often have other kinds of restrictions. There are the familiar restrictions of disciplinarity and rhetoric, but projects receiving funding from certain sources are sometimes barred, as are research objects of illegitimate provenance (notably in archaeology). The entire notion of "research ethics" presumes that ignorance in certain situations is preferable to knowledge by improper means. The American Medical Association in 1996 recommended that scientific journals refuse to publish research funded by the tobacco industry,⁵⁴ and there are calls now for history journals to do the same—given the covert industry support for such publications.⁵⁵ Historians haven't yet had much experience limiting research from such sources, and few professional journals require disclosure of potential conflicts of interest. That could change, as historians realize that their research can be "bought" as easily as any other kind. Disclosures and even "transparency" are double-edged swords, however, as shown by the tobacco industry's work to draft and organize passage of the Data Access Act of 1998 and the Data Quality Act of 2000. The new laws allow the industry to obtain the raw data of anyone publishing any kind of scientific or medical study using federal funds; the industry pushed for legislation of this sort to allow it to reanalyze and reinterpret (that is, look for flaws in) research suggesting a tobacco hazard of one sort or another.⁵⁶ Philip Morris employed Multinational Business Services and other front organizations to push through these laws—over objections from both the National Academy of Sciences and the American Association for the Advancement of Science. The bottom line: the seemingly noble goal of transparency can be an instrument in the service of organized duplicity.

One key principle of research ethics—as of ethics more generally—is that not all things are worth knowing at any cost. Many kinds of scientific experiments are barred, either legally or less formally, which amounts to a tolerance for ignorance in realms where the costs of gaining knowledge are judged to be too high. An interesting example of deliberate refusal of knowledge is the agreement by most journals of archaeology not to publish artifacts without an explicit and acceptable "provenance" demonstrating that the object in question was obtained either legally in recent years, or illegally prior to some agreed-on cutoff point. Estimates are that as many as half of all artifacts in museum collections have been obtained illegally—though legal standards have changed considerably in this realm over time. The logic for the policy is that unrestricted publication will encourage looting, since publication is part of the process by which artifacts obtain value (via both certification and publicity). Different archaeological traditions regard this question of how to treat lootings very differently. "Contextualists" (aka "dirt archaeologists," who study sites laid out in square meters) tend to take the hard line, arguing that artifacts without proper provenance should not be published. (Some even imply they should be destroyed, in the same way that Daniel Arap Moi burned all that ivory.) Linguistic archaeologists—decoders—tend to be more tolerant, pointing out that all evidence available must be taken into account if translations (of Mayan stelae, for example) are to be possible. These different epistemic traditions have different attitudes toward looting: "dirt" archaeologists tend to value context, the first victim of looting, whereas philologists tend to value comparative analysis of series of "great artifacts," which often requires access to artifacts in private collections. The two traditions have different understandings of the costs of certain kinds of knowledge and ignorance.

If knowledge is power (which it sometimes is but not always), then to dismantle certain kinds of power may require the reintroduction of bodies of ignorance—hence impotence—in that realm. History is full of such undoings, the deliberate abandonment of skills to improve some way of life. And we're not just talking Amish virtues: who now knows all the techniques slave owners once possessed of how to control slaves? That is lost knowledge, as it should be, save perhaps for museums. Who could lament the loss of knowledge of all the world's ways to torture, the cogni-

tive equivalent of smallpox stocks? Refusals of technology are often of this sort. We often hear that you can't turn the clock back, an idea as absurd as the notion that thieves cannot be brought to justice. It is not only for foolishness that technologies have been avoided, refused, or abandoned.

In Ireland, the eel fishermen of Lough Neagh no longer fish with power-driven nets; a decision was made in the 1960s to restrict all fishing in the lake to hand-drawn nets, to sustain the diminishing stocks. Leaf blowers are being banned in many communities, and many of us look forward to the day when doctored monocrop lawns will be seen as pathology. The Japanese lived for more than a hundred years without the gun. Protests against novel technologies are often lumped under the ridiculous rubric of "luddism," a term too often forgotten to have sprung from moral complaints with good reasons. Iain Boal in his forthcoming *Long Theft* shows how the breaking of looms in the early decades of the nineteenth century gave rise to the modern industrial strike (for better working conditions); protests against technologies and knowledge practices are rarely the result of people fearing modernity in the abstract.

There are many other reasons people might not want to have all knowledge omnipresent all the time. Not everyone wants to know what kinds of genetic diseases they (or their children) may be harboring in their genomes. Archaeologists deliberately don't publish the location of certain excavation sites, fearing looting (botanists do the same for new cactus finds), and **some ethnographers are publishing knowledge of certain biopharmaceuticals in "indigenous" languages to give locals an edge against the multinationals.** Access to all kinds of information is limited—ignorance is deliberately created—for more reasons than the moon has craters.

The lesson is one that should have been applied in all of the recent hysteria over the myriad vulnerabilities of Americans to terrorist attack. The nightly news for months was full of exposes of how this or that bridge or granary could be bombed or poisoned, in a gargantuan paranoid proclamation of national victimhood. "News" about potential threats and "security gaps" arguably did more to give people worries (and ideas) than to encourage any truer sense (and reality) of safety; there is such a thing as dangerous knowledge, things we don't need to know. Total Information Awareness is not for everyone.

SOME QUESTIONS

There are lots of ways to think about ignorance—as tragedy, as crime, as provocation, as strategy, as stimulus, as excess or deprivation, as handicap, as defense mechanism or obstruction, as opportunity, as guarantor of judicial neutrality, as pernicious evil, as wondrous innocence, as inequity or relief, as the best defense of the weak or the common excuse of the powerful, and so forth. There are surely as many ways to think about ignorance as of knowledge, with the sociology just as intricate in both instances. There are lots of different kinds of ignorance, and lots of different reasons to expose it, undo it, deplore it, or seek it.

Here some questions for further reflection: What other kinds of work does ignorance do? How else is it created, via what other kinds of inattention, disinterest, calculation, resistance, tradition, or distraction? And when does knowledge create ignorance? Wes Jackson has called the modern university "an engine of distraction"; how does pursuit of certain kinds of knowledge produce such "distractions"? Is ivory tower reclusion required for certain kinds of knowledge production? How do disinterests and apathies come into being, and what patterns of competence or disability are thereby brought into being?

We tend to think of ignorance as something negative, but when can it become a virtue? Or an imperative? The philosopher John Rawls has championed a "veil of ignorance" as a kind of ethical method: we are supposed to imagine ourselves not knowing where we ourselves will figure in an ethical situation; ignorance of how we personally might gain is supposed to guarantee a kind of neutrality and therefore balance in judging such situations. We find something similar in the courtroom, where jurors are supposed to be ignorant of the particulars of the crime they are evaluating—versus prior to the seventeenth century, when jurors were supposed to know as much as possible about the case in question. (Jurors were only later clearly separated from witnesses, the theory being that ignorance will prevent bias.) Knowledge here is interestingly attached to bias, ignorance to balance.

And how important is the genesis of ignorance for modern corporations? Many companies cultivate ignorance as a kind of insurance policy: if what you don't know can't hurt you, sometimes it is safer not

to know. Document retention policies of many companies were revised in the wake of the Master Settlement Agreement (1998), which forced tens of millions of previously secret tobacco industry documents onto the Internet. The traditional corporate lawyers' trick of flooding a plaintiff with documents (aka "dumping") backfired with the rise of the Internet and search engines, leading information holders to recognize the dangers of a long paper trail. In the new millennium, many companies have adopted email deletion policies to avoid leaving such trails (paper or electronic), the theory again being that what you don't know can't hurt you. (Though failure to keep accurate records has itself been used in certain lawsuits, alleging destruction of documents.)

And what about in medicine, or the science of public health? Richard Peto has argued that ignorance of a certain type is essential for progress in the science of epidemiology. No one needed to know anything about the biochemistry of cancer to realize that cigarettes were causing the disease; it was crucial to "black box" the things we didn't know, rather than waiting paralyzed until knowledge had come in on every front.⁵⁷ The tobacco industry has spread confusion on this point, pretending that every last fact must be known about a disease before we can say what causes it. John Snow's removing the handle from the water pump at Charing Cross is the contrary lesson—warts and all: sometimes we know enough to act, despite oceans of ignorance. Ignorance must be productive or virtuous (not the same thing) in many other contexts—what are they? The history of discovery is littered with fertile mistakes—think of Columbus, emboldened to cross the Atlantic by virtue of an overly conservative estimate for the size of the globe. What other examples are there of fertile ignorance?

And when does ignorance beget confidence, arrogance, or timidity? Charles Darwin once wrote that "ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science."⁵⁸ Darwin implies that knowledge leads us to a kind of productive humility—but how often is this true? His point is not the Socratic one, that "the more you know the more you realize how little you know," but rather that the more you know, the more you realize that

science can go forward, trouncing ignorance. George Gaylord Simpson has taken a different tack, claiming that our capacity for ignorance is central to what it means to be human: "Man is among many other things, the mistaken animal, the foolish animal. Other species doubtless have much more limited ideas about the world, but what ideas they do have are much less likely to be wrong and are never foolish. White cats do not denigrate black, and dogs do not ask Baal, Jehovah, or other Semitic gods to perform miracles for them."⁵⁰ To be human is to be ignorant, apparently.

Crucial also is: ignorance for whom? and against whom? Ignorance has a history and is always unevenly distributed; the geography of ignorance has mountains and valleys. Who is ignorant and why, and to what extent? How can we develop better agnometric indicators? What keeps ignorance in one place, while it evaporates in some other? And which among our myriad ignorances will be tolerated or combated?

Many of these same questions can be asked about knowledge since, like ignorance, it occupies space and takes us down one path rather than another. Knowledge, too, has a face, a house, and a price—there are people attached, institutions setting limits, and costs in the form of monies or opportunities lost. Decisions of what kind of knowledge "we" want to support are also decisions about what kinds of ignorance should remain in place.

SUMMARIZING, THEN: it is our hope that readers will be convinced that there are a lot of good reasons to explore ignorance. There is surely quite a lot of it, as much as we are willing to let our arrogance acknowledge. Agnotology could be a challenge to hubris, if there is modesty in learning how deeply ignorant we are. Think of the countless different ways it is generated: by ingesting lead or by watching TV, or by fatigue or fear or isolation or poverty or any of the other myriad experiences that deaden human life. Think of ignorance generated by failures of the body, or failures to fund education, or free access to bogus information, or practices and policies that enlarge secrecy or prevarication or compartmentalization. People have extracted very different things from different kinds of unknowns, and will no doubt continue to mix suspect with admirable reasons for letting those flourish or disappear.

POSTSCRIPT ON THE COINING OF
THE TERM "AGNOTOLOGY"

Some time into this project I learned that there already was a word that has been used to designate the study of ignorance, albeit with a quite different slant from how we shall be using the term. Apart from being obscure and somewhat inharmonious, *agnotology* has often been taken to mean "the doctrine of things of which we are necessarily ignorant" in some profound metaphysical sense. My hope for devising a new term was to suggest the opposite, namely, the historicity and artifactuality of non-knowing and the non-known—and the potential fruitfulness of studying such things. In 1992, I posed this challenge to the linguist Iain Boal, and it was he who came up with the term *agnotology*, in the spring of that year.

Coinage for science terms in Anglophonia is conventionally from the Greek, so that is where he started. Ignorance in Greek really has two forms: *agnoia*, meaning "want of perception or knowledge," and *agnosia*, meaning a state of ignorance or not knowing, both from *gnosis* (with a long o or omega) meaning "knowledge," with the privative (negating) *a*-prefix. (We didn't look for a harmonious negation of *episteme*.) Alternative designations for the study of ignorance could have been *agnosiology*, or *agnarology* (using the Latin compounding rule), or even *agnoskology*, designating more properly a study of the unwillingness or inability to learn, from *gignosko* (with both o's as omegas), the first-person singular present indicative active form of the verb meaning "to know."

Iain crafted *agnotology* from among these possible options, using *gno* as the root (meaning "to know"), *a* as the negating prefix, a *t* added as the marker of the participial (yielding *gnot*), and *-ology* as the denominative suffix. We chose *-ology* largely on phonaesthetic grounds, with the *logos*-derived suffix lying roughly in the midrange of the hubris continuum, avoiding alternatives such as the more archaic *agnonomy*, the vivid yet micro-tainted *agnoscopy* (with its tilt to molecular coproscopy), the Latin-Greek mongrel *ignorology*, the Anglo-Saxon romantic yet overly quaint "ignorance-lore" (Lorraine Daston's tongue-in-cheek suggestion), the hyperempirical *ig-* or *agnotometry* (or *-metrics*), and the self-marginalizing "ignorance science" or "ignorance studies," with its taint for those who scoff that "if there's *science* in the title, it isn't one."

We had originally spelled our new term with two *a*'s (*agnatology*) to avoid having people elongating and accenting the second *o* (as in agnostic or ignoble), recognizing also that vowels are essentially fillers in written language, following Voltaire's famous maxim that etymology is "a science in which the consonants count for very little, and the vowels for even less." (Try replacing all vowels in a text with the letter *a*, *e*, or *i*; and of course there are many languages that drop them altogether, such as Hebrew.) Protests over this second *a* came from a number of quarters, among these a few biologists who insinuated that we were infringing on the study of jawless ("agnathic") fish. More serious was the objection that *agnate* was already a word, meaning "relative" (from *ad gnatus*). In the spirit of scholarly harmony we decided to rechristen our neologism *agnotology*, recognizing that while the meanings of words lie only in their use, their use can also depend on how and for what ends they are created.



SOME FAMOUS QUOTATIONS ABOUT IGNORANCE

Real knowledge is to know the extent of one's ignorance.

Confucius (551 **BC**-479 **BC**)

The loss which is unknown is no loss at all.

Publilius Syrus, *Maxims* (c. 100 **BC**)

To know that we know what we know, and to know that we do not know what we do not know, that is true knowledge.

Nicolaus Copernicus (1473-1543)

Ignorance of certain subjects is a great part of wisdom.

Hugo De Groot (1583-1645)

Ignorance is preferable to error; and he is less remote from the truth who believes nothing, than he who believes what is wrong.

Thomas Jefferson, *Notes on the State of Virginia* (1785)

All you need in this life is ignorance and confidence; then success is sure.

Mark Twain, December 2, 1887

Education is a progressive discovery of our own ignorance.

Will Durant (1885-1981)

Ignorance is strength.

George Orwell, 1984

*Theology is the effort to explain the unknow-
able in terms of the not worth knowing.*

PL L. Mencken (1880-1956)

Ignorance is king, many would not prosper by its abdication.

Walter M. Miller, *A Canticle for Leibowitz* (1959)

It's innocence when it charms us, ignorance when it doesn't.

Mignon McLaughlin, *The Neurotic's Notebook* (1960)

*Our knowledge can only be finite, while our ig-
norance must necessarily be infinite.*

Karl Popper, *Conjectures and Refutations* (1963)

*Reports that say that something hasn't happened are always interesting
to me, because as we know, there are known knowns; there are things
we know we know. We also know there are known unknowns; that is
to say we know there are some things we do not know. **But there are
also unknown unknowns—the ones we don't know we don't know.**
**And if one looks throughout the history of our country and other free
countries, it is the latter category that tend to be the difficult ones.***

Donald H. Rumsfeld, Department of Defense news briefing,

February 12, 2002

NOTES

1. The reference is to Harvard's *Philosophy* 253.
2. A Google search of December 2001 yielded 145,000 hits for "epistemology," including objectivist, subjectivist, virtue, analytic, genetic, affective, iceberg, and Chicana feminist. For the gamut, see <http://pantheon.yale.edu/~kd47/e-page.htm>.
3. Two solid exceptions: Peter Wehling, "Weshalb weiss die Wissenschaft nicht, was sie nicht weiss? Forschungsperspektiven einer Soziologie des wissenschaftlichen Nichtwissens," <http://www.sciencepolicystudies.de/wehling%20Expertise.pdf>; and Michael Smithson, "Toward a Social Theory of Ignorance," *Journal for the Theory of Social Behavior* 15 (1985): 151-172. An earlier discussion in the functionalist mood can be found in W. E. Moore and M. M. Tumin, "Some Social Functions of Ignorance," *American Sociological Review* 14 (1949): 787-795.
4. The philosopher Paula Driver argues that one version of modesty consists in being ignorant of one's actual merits. Charity can similarly consist in not noticing—or failing to be aware of—the faults of others; see her *Uneasy Virtue* (Cambridge, UK: Cambridge University Press, 2001).
5. Harry Marks, "Misunderstanding Pellagra: Gender, Race and Political Economy in Early-20th-Century Epidemiology," *History of Science Colloquium*, Welch Medical Library, JHMI (2001).
6. Fetal alcohol syndrome was discovered circa 1900 and then forgotten with the discrediting of its eugenics scaffolding; see Philip J. Pauly, "How Did the Effects of Alcohol on Reproduction Become Scientifically Uninteresting?" *Journal of the History of Biology* 29 (1996): 1-28.
7. David Reich, "Building Superman," review of Nicholas Gillham, *A Life of Sir Francis Galton* (New York: Oxford University Press, 2001), in the *New York Times Book Review*, February 10, 2002: 16.
8. "So long as the mother, Ignorance, lives, it is not safe for Science, the offspring, to divulge the hidden cause of things" (Kepler, 1571-1630).
9. Malcolm Ritter, "Americans Show They Don't Know Much about Science," AP, June 16, 2002 (based on an NSF-funded survey).
10. August Comte makes this explicit in his *Cours de philosophie positive* (1830-1842); see Auguste Comte and *Positivism, the Essential Writings*, ed. Gertrud Lenzer (New York: Harper and Row, 1975), 73, 94, 465-474, and 84.
11. This is Robert K. Merton's idea of "specified ignorance"; see his "Three Fragments from a Sociologist's Notebooks: Establishing the Phenomenon, Specified Ignorance, and Strategic Research Materials," *Annual Review of Sociology* 13 (1987): 1-28. Merton's point is really only that questions not asked are questions not answered, and that scientists need to make what they don't know explicit as "a first step toward supplanting that ignorance with knowledge" (10).
12. R. Duncan and M. Weston-Smith, *The Encyclopaedia of Medical Ignorance: Exploring the Frontiers of Medical Knowledge* (Oxford: Pergamon, 1984).
13. Smithson, "Toward a Social Theory of Ignorance," 153.
14. Sut Jhally, Justin Lewis, and Michael Morgan, "The Gulf War: A Study of the Media, Public Opinion, and Public Knowledge" (Research Report. Centre for the Study of Communication, Doc. #P-8, February 1991).
15. Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction" (1935), in his *Illuminations*, ed. Hannah Arendt (New York: Schocken, 1969), 238.
16. David Dickson, "Weaving a Social Web," *Nature* 4T4 (2001): 587.

17. Kenneth Burke, *Permanence and Change* (New York: New Republic, 3935), 70. The idea of selective bias has fallen on hard times in recent sociology of science. All science is said to be selective, so it becomes only trivially true to say that any particular pattern of inquiry is selective, since it cannot have been otherwise. The so-called Strong Programme in the sociology of knowledge also tended to regard the social construction of ignorance (or error) as "easy" or "trivial" by comparison with the social construction of truth.
18. Ian Hacking, *The Social Construction of What?* (Cambridge, MA: Harvard University Press, 2000).
19. Sissela Bok, *Secrets: On the Ethics of Concealment and Revelation* (New York: Random House, 1990).
20. Mario Biagoli, "From Book Censorship to Academic Peer Review," *Emergences* 12 (2002): 11-45.
21. William R. Newman and Anthony Grafton, eds., *Secrets of Nature: Astrology and Alchemy in Early Modern Europe* (Cambridge, MA: MIT Press, 2001).
22. W. R. Van Meter in his "Putting False Faces on Formulas" (*Food Industries*, October 1941, 41-42) advised food chemists to disguise valuable formulas "so that workmen do not get wise to it and competitors cannot steal it. The idea is to use arbitrary units of measurement and adopt coined names for ingredients" (41).
23. William Poundstone, *Big Secrets: The Uncensored Truth about All Sorts of Stuff You Are Never Supposed to Know* (New York: William Morrow, 1985).
24. See my *Cancer Wars: How Politics Shapes What We Know and Don't Know about Cancer* (New York: Basic Books, 1995), esp. p. 8n and Chapter 5 on "Doubt Is Our Product."
25. The PR firm of Hill and Knowlton is often blamed, but Paul Hahn, president of the American Tobacco Co., was surely involved; see my forthcoming *Golden Holocaust*. Compare also my *Cancer Wars*, Chapter 5; Gerald Markowitz and David Rosner, "Expert Panels and Medical Uncertainty," *American Journal of Industrial Medicine* 19 (1991): 131-134; and Allan M. Brandt, *The Cigarette Century* (New York: Basic Books, 2007), 159-207.
26. See my "Everyone Knew but No One Had Proof: Tobacco Industry Use of Medical History Expertise in U.S. Courts, 1990-2002," *Tobacco Control* 15 (2006): iv 117-125.
27. Kenneth Ludmerer, testimony in *Boeken v. Philip Morris, Inc., et al.*, Superior Court of California for the County of Los Angeles, Case No. BC 226593, Transcript of Proceedings, vol. 31A, 5262.
28. The words "deceive," "misleading," "fraud," and cognates appear 454 times with reference to tobacco industry actions in Judge Gladys Kessler's "Final Opinion" in *USA v. Philip Morris et al.* (August 18, 2006), online at <http://www.tobaccolawcenter.org/documents/FinalOpinion.pdf>. The Court here notes that numerous "acts of concealment and deception" were made "intentionally and deliberately" as part of a "multifaceted, sophisticated scheme to defraud." The Court also concludes that "from at least 1953 until at least 2000, each and every one of these Defendants repeatedly, consistently, vigorously—and falsely—denied the existence of any adverse health effects from smoking. Moreover, they mounted a coordinated, well-financed, sophisticated public relations campaign to attack and distort the scientific evidence demonstrating the relationship between smoking and disease, claiming that the link between the two was still an 'open question'" (330-331).
29. The tobacco industry sometimes defends itself by suggesting that the public was never convinced by its "no proof of harm" propaganda. During my expert deposition of

July 2002 for the plaintiffs in USA v. Philip Morris I was shown an industry document from the 1970s suggesting that confidence in the industry was low by comparison with medical and public health groups. The industry's inference was essentially: yes, we lied, but nobody believed us. Fraud, it seems, is not fraud if no one believes you.

30. Cited in Jones, Day, Reavis, and Pogue's 450-page "Corporate Activity Project" (1986), available online at <http://www.tobacco.org/resources/documents/jonesdayi.html>, 390. Clarence Cook Little was scientific director of TIRC but "took orders" from the TI on this occasion.

31. Louis Harris, "Most Still Doubt Cigarettes Are Major Cause of Cancer," Washington Post, January 2, 1967, Bates 500323778.

32. Use of Tobacco: Practices, Attitudes, Knowledge, and Beliefs. United States—Fall 1964 and Spring 1966 (U.S. Department of Health, Education, and Welfare: July 1969), 52, 68.

33. California EPA, Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant (Sacramento: California EPA, 2003).

34. See my "Should Medical Historians Be Working for the Tobacco Industry?" Lancet 363 (2003): 1174.

35. See my "Everyone Knew but No One Had Proof," iv117-iv125.

36. "Chronology and Development of Project Cosmic" (Philip Morris), 1988, Bates 2023919844-9907; "Project Cosmic," February 18, 1992, Bates 2040573257-3270. Documents with "Bates" numbers (litigation codes) are searchable online at <http://legacy.library.ucsf.edu/>.

37. "Plans for the Smoking Research Project" (Philip Morris), 1988, Bates 2001260131-0136.

38. "Chronology and Development of Project Cosmic," Bates 2023919844-9847.

39. "Project Cosmic: Budget/Spending Status," February 1991, Bates 2023160927.

40. David Harley, "The Beginnings of the Tobacco Controversy: Puritanism, James I, and the Royal Physicians," Bulletin of the History of Medicine 67 (1993): 28. Harley's article conveys this message of a timeless "controversy" that may never be resolved; Musto similarly talked about a pendulum swinging from endorsement to condemnation of drug use, with a periodicity of about seventy years. This latter idea was picked up by a number of science reporters (Gina Kolata, for example), none of whom recognized the thesis as an industry concoction designed to make smoking seem natural and inevitable.

41. Stanton A. Glantz, John Slade, Lisa A. Bero, Peter Hanauer, and Deborah E. Barnes, eds., The Cigarette Papers (Berkeley: University of California Press, 1996), 171-200.

42. Jones, Day, Reavis, and Pogue, "Corporate Activity Project," 71.

43. Fred Panzer to Horace R. Kornegay, May 1, 1972, Bates 87657703-7706.

44. Glantz et al., Cigarette Papers, 171.

45. Daniel J. Edelman, "INFOTAB ETS-Project: The Overall Plan," March 12, 1987, Bates 2022934011-4024, p. 8.

46. Craig L. Fuller, Senior Vice President, Corporate Affairs, and Kathleen Linehan, Vice President, Government Affairs, "Presentation for the Board of Directors—June 24, 1992," June 24, 1992, Bates 2047916010.

47. See Naomi Oreskes' essay in this volume and George Monbiot, Heat: How to Stop the Planet from Burning (London: Allen Lane, 2006); also my Cancer Wars, Chapter 5.

48. Carole Gallagher, American Ground Zero: The Secret Nuclear War (New York: Doubleday, 1993).

49. James Bamford, *The Puzzle Palace: A Report on America's Most Secret Agency* (Boston: Houghton Mifflin, 1982).
50. Scot Shane, "Official Reveals Budget for U.S. Intelligence," *New York Times*, November 8, 2005.
51. Naomi Oreskes, *The Rejection of Continental Drift: Theory and Method in American Earth Science* (New York: Oxford University Press, 1999).
52. Ronald E. Doel, "Polar Melting When Cold War Was Hot," *San Francisco Examiner*, October 3, 2000, A15.
53. Republican political strategist Frank Luntz prior to the November 2000 presidential election warned party members that the scientific debate on global warming was "closing but not closed," and advised his party to be more aggressive in recruiting sympathetic experts who would encourage the public not to "rush to judgment before all the facts are in." The stakes were clear: "Should the public come to believe that the scientific issues are settled, their views about global warming will change accordingly. Therefore, you need to continue to make the lack of scientific certainty a primary issue." Cited in Heather Boonstra, "Critics Charge Bush Mix of Science and Politics Is Unprecedented and Dangerous," *The Guttmacher Report on Public Policy*, May 2003, 2.
54. "Tobacco-funded Research," [AMEDNEWS.COM](http://www.AMEDNEWS.COM), July 22, 1996, at http://www.ama-assn.org/sci-pubs/amnews/amn_96/summo722.htm [accessed January 2002].
55. See again my "Should Historians Be Working for the Tobacco Industry?"
56. Annamaria Baba, Daniel M. Cook, Thomas O. McGarity, and Lisa A. Bero, "Legislating 'Sound Science': The Role of the Tobacco Industry," *American Journal of Public Health* 95 (2005): S20-27; Rick Weiss, "'Data Quality' Law Is Nemesis of Regulation," *Washington Post*, August 16, 2004, p. A1.
57. Richard Peto, "Ignorance in Cancer Research," in Duncan and Weston-Smith, eds., *The Encyclopaedia of Medical Ignorance*, 129-133.
58. Charles Darwin, *Descent of Man* (1871) (Princeton, NJ: Princeton University Press, 1981), 3.
59. George Gaylord Simpson, *This View of Life* (New York: Harcourt, Brace and World, 1964), viii.