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## Epistemology: Who Needs It? \*

Susan Haack

... as we know, there are known knowns; there are things that 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.—Donald Rumsfeld.<sup>1</sup>

In 2002, Donald Rumsfeld's ruminations on the failures of U.S. military intelligence in Iraq won the Plain English Campaign's annual prize for "most baffling remark made by a public figure" —narrowly beating Arnold Schwarzenegger's "gay marriage is something that should be between a man and a woman," and Christopher Patten's "having committed political suicide, the Conservative party is now living to regret it."<sup>2</sup> I too chuckled at Secretary Rumsfeld's verbal contortions; but I thought he had a point—an epistemological point.

What that point was will become clear in due course; but first I need to say something about what epistemology is, and how it bears on real-world issues. Having worked in this field for decades, I find myself calling on epistemological ideas almost every day: when I wonder, e.g., what to make of an article claiming that there is empirical evidence showing that adolescents and young adults should be given preference over infants and older people in the allocation of scarce medical resources; whether "evidence-based medicine" is as obviously desirable as its proponents make it sound—and if so, why many people distrust the idea; or what lessons to draw from the revelation that the medical scientist whose work provoked widespread panic about the supposed dangers of MMR (mumps, measles, and rubella) vaccine had doctored his results, or that mainstream climate scientists had tried to suppress work dissenting from the majority view; etc., etc. You will soon see why.

In 1843, John Stuart Mill wrote that "[t]he business of the magistrate, of the military commander, of the physician, of the agriculturalist, is merely to judge of evidence, and to act accordingly."<sup>3</sup> He's right. In fact,

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we *all* need to “judge of evidence, and to act accordingly” —in deciding what to eat, whom to trust, whether to undergo a suggested medical treatment, etc. We can’t act safely or effectively unless we have some idea what is likely to happen if we do this or that; which requires going with such evidence as we have, or can obtain. Often, also, we need to consider the sources of our evidence, and the possibility that it has been impoverished or distorted as it was passed along; and to discriminate well- from poorly-conducted inquiry—and good-faith efforts to discover the truth from attempts to minimize a scandal or frame a convenient suspect.

Our so-called “Age of Information” is marked, not only by a growing dependence on electronic media and gadgetry for disseminating information, but also by an unprecedented flood of information itself; and by a growing sense that social policies—on the environment, the economy, public health, education, the justice system, international relations, etc.—should be based on knowledge of their benefits, and their costs. It is indeed desirable that social, like individual, decisions be informed by whatever we can find out about the likely consequences of doing this or that—or doing nothing. We shouldn’t forget, though, that factual information alone can’t tell us what policies to adopt: what the costs and benefits are of damming this river, raising the highest tax-rate by 10%, requiring that all children be vaccinated against this disease, or etc., is one thing; whether the benefits *outweigh* the costs is quite another. (Formal cost-benefit analyses, which inevitably *presuppose* evaluative judgments in identifying relevant factors and assigning them weight, can’t close the gap.)<sup>4</sup> Nor should we forget that acquiring information takes effort and, often, money; or that, as the hunger for information grows, not only more and more information, but also more and more *misinformation*, becomes available; and not only more and more research, but also more and more *pseudo-research*, is conducted. It gets harder and harder to sift the good stuff from the dreck.

Some—perhaps disillusioned by how common pseudo-inquiry is, and how often confidently-made claims turn out to be false—profess to have lost confidence in the concepts of evidence, truth, inquiry, etc., altogether. Richard Rorty, for one, avers that he “do[es] not have much use for the notion of ‘objective truth,’”<sup>5</sup> and sees “rationality as civility, ... respect for the opinions of those around one, ... [and] ‘true’ as a word which applies to those beliefs upon which we are able to agree.”<sup>6</sup> But when they decide on medical treatment, choose a flight, or call the bank to make sure the check from their publisher has arrived, like everyone else Rorty and his fellow-cynics go by the evidence they have or can obtain—revealing

that they don't really believe, as they profess, that (as they would say) "so-called 'truth,'" "so-called 'evidence,'" etc., are pure social convention, with no objective basis.

The discipline to which it falls to articulate what distinguishes genuine inquiry from pseudo-inquiry, what makes inquiry better- or worse-conducted, evidence stronger or weaker, etc., is the philosophical theory of knowledge, known in the trade as "epistemology" — a charmless and off-putting word for what is too often, I'm afraid, a charmless and off-putting enterprise. (As journalist Jonathan Rauch observed in an acute book on campus speech codes, "[i]f you want to empty the room at a cocktail party," all you have to do is say "epistemology.")<sup>7</sup> Nevertheless, if you want to understand such vital practices as assessing the worth of evidence and the quality of inquiry, epistemology is what you need.

I don't mean to suggest that everyone needs epistemological theory simply to go about their everyday business. Here is Mill again: "[m]ankind judged of evidence, and often correctly, before [epistemology] was a science, or they never could have made it one."<sup>8</sup> Again, he's right. Usually we can assess the worth of evidence well enough without giving it much sustained thought, or needing any epistemological theory. But such theory can be genuinely helpful when evidence is complex or ambiguous, or the subject-matter so emotionally colored that we are in danger of losing our cool—as often happens in courts of law, in politics, on medical and public-health issues, on environmental questions and, yes, in matters of military intelligence.

I don't mean to suggest, either, that *only* the work of professional epistemologists can be of use; there are epistemological insights in the work of legal scholars, historians, and scientists, etc.: e.g., mathematician W. K. Clifford's shrewd observation that "the credulous man is father to the liar and the cheat";<sup>9</sup> and physicist Percy Bridgman's thought-provoking comment that when "the man [with] an appreciation and capacity for intellectual integrity" thinks about our social institutions, his "inevitable reaction will obviously be a complete repudiation in his own mind of the bunk that he is asked to accept."<sup>10</sup> There are epistemological insights, too, in works of fiction: e.g., in Scott Turow's *Reversible Errors*,<sup>11</sup> where a criminal-defense attorney handling a last-minute death-penalty appeal uncovers new evidence that makes it seem more and more likely that his client is guilty—until he finds one crucial piece of evidence that reveals that all the rest was misleading; in Michael Frayn's *Headlong*,<sup>12</sup> where a philosophy lecturer desperately trying to find out whether the painting

he hopes to buy cheap from his clueless aristocratic neighbor really is, as he believed at first glance, a priceless missing Bruegel, uncovers evidence that seems to show, yes, that it is—no, that it isn't—yes, that it is, .... and so on; and in Arthur Hailey's *Strong Medicine*,<sup>13</sup> where a medical scientist wants so badly to believe that his new drug is a real breakthrough that, when evidence of dangerous side-effects begins to trickle in, he feels justified in suppressing it.

Nor do I mean to suggest that *all* the work of professional epistemologists will be useful to "the magistrate, the military commander, the physician," or the rest of us, as we struggle with complex or disturbing evidence. As I hinted earlier, much contemporary work in epistemology is hermetic and self-absorbed; and anyway, work on the definition of "knowledge" or the refutation of skepticism, or approaches (like reliabilism or virtue epistemology) that play down the role of evidence, are little help with the real-world questions that concern us here.<sup>14</sup> What we need is epistemological theory focused on core issues about inquiry, evidence, etc.; spelled out in enough detail to deal with evidence of serious complexity; and, at least approximately—well, *true*.

As Nicholas Rescher once observed, "if two people agree, one of them isn't a philosopher."<sup>15</sup> He exaggerates; but not much. What I offer here will be, not *the* epistemological perspective, but *my* perspective on a battery of key epistemological questions about the difference between pseudo-inquiry and the real thing, about evidence and quality of evidence, about how information is transmitted and can be distorted, and about expertise.

Genuine inquiry is an attempt to discover the truth of some question. This means, not that scientists, historians, etc., seek The Truth, in a quasi-religious sense, but that, e.g., a historian investigating whether Thomas Jefferson was the father of his house slave's children wants to end up concluding that Jefferson was the father of these children just in case he *was* their father, and that he wasn't if he wasn't (and that it's a lot more complicated than that if it *is* a lot more complicated than that);<sup>16</sup> that a scientist investigating global warming wants to end up concluding that global warming is man-made just in case global warming *is* man-made, and that it isn't if it isn't (and, etc.); and so on.

A serious inquirer will seek out all the evidence he can, and do his best to assess whether it warrants this conclusion or that, or is insufficient to warrant any conclusion at all. But someone who already knows what conclusion he intends to reach, and is looking for evidence that supports it—and for ways to disguise or play down evidence that points

elsewhere—isn't really inquiring; for it is part of the meaning of the word "inquire" that *you don't know how things will turn out*.<sup>17</sup> That's why, when the government or our university launches an Official Inquiry into a disturbing scandal, some of us—suspecting that this "inquiry" will arrive at the desired, reassuring conclusion no matter *what* the evidence—reach for our scare quotes.

To be sure, people's motives are usually mixed, so there is a continuum of intermediate cases where what is going on is neither pure, disinterested inquiry nor outright sham: e.g., a scholar who has obtained a grant on the basis of an over-optimistic description of what his project will achieve, and fudges his report to avoid jeopardizing his prospects for future grant money; a scientist whose inadequate records of his work allow him to forget the inconvenient evidence his hypothesis can't explain;<sup>18</sup> or a detective whose suspicions have focused prematurely on a single suspect, and who shrugs off evidence that might point to others.

Someone who desperately needs the money may persuade himself that he has a good chance of winning the lottery; someone who greatly fears that the mole that has appeared on his nose is cancerous may persuade himself that it looks worse than it really does. But the hope has no bearing on the likelihood that the ticket will win, nor the fear on the likelihood that the mole is malign; our wishes, hopes, and fears can affect our judgment of evidence, but they are not themselves evidence. Evidence consists, rather, of what we see, hear, etc. (experiential evidence) and background information (reasons); which, as I argued in *Evidence and Inquiry*,<sup>19</sup> work together rather like clues and already-completed entries in a crossword puzzle.

Evidence may be better or worse; and whether, and if so, to what degree, a claim is warranted depends on how good the evidence is with respect to that claim. Reasons ramify, like crossword entries; and what makes evidence better or worse is analogous to what makes a crossword entry more or less reasonable: how *supportive* it is (analogue: how well an entry fits with its clue and already completed entries); how *secure* it is, independent of the claim in question (how reasonable the already-completed entries are); and how *comprehensive* it is, how much of the relevant evidence it includes (how much of the crossword has been completed). As this third clause reveals, if your evidence is too sketchy, you're not entitled to believe either way—which is no doubt why the English word "partial" has its two meanings: "incomplete," and "biased." As it also reveals, that we have no evidence that *p* doesn't mean that we

have evidence that not-*p*.

What evidence is relevant to a claim depends on facts about the world. If character really is revealed by handwriting, how a person writes the letter “g” might be relevant to whether or not he is honest; but if not, not. If rats are like human beings in the relevant respects, what effect this drug has on them is relevant to what effect it will have on humans; but if not, not. (Thalidomide was tested on pregnant rats with no ill-effects on them, or their offspring; but, though it had a strong sedative effect on humans, it had no such effect on the rats. Perhaps if—instead of devising new tests to show that the rats *were*, really, a bit sedated—the manufacturer’s scientists had wondered whether there was some relevant physiological difference between rats and humans, the Thalidomide tragedy might have been avoided.)<sup>20</sup> To repeat: judging the quality of evidence requires factual knowledge.

Moreover, our evidence is often second-hand:<sup>21</sup> e.g., when I choose a flight based on information an airline representative gives me; when a scientist reaches a conclusion using complicated instruments, or relying on other peoples’ observations or statistical calculations, etc.; or when a physician prescribes a treatment relying on results published in medical journals, or on what a pharmaceutical-company representative tells him about off-label uses for a drug. We rarely think about this, unless we fear we’ve been let down; but we all depend implicitly on assumptions about how reliable these machines, instruments, or people are, how successful this scientific journal is at selecting reliable work, how likely a drug-company representative is to tell the whole truth about the benefits and side-effects of a profitable product, or an airline representative to look for all available flights, etc. We can’t get by without relying on evidence passed on by others; so we can’t avoid the necessity, not only of judging how likely it is that they are telling the truth as they believe it to be, but also of judging how adequately *they* judge the evidence *they* have.

Even in the most primitive societies, people rely on others’ reports about the best place to find game or cross a river, on knowledge passed down from one generation to the next about the medicinal properties of plants, etc. And in complex modern societies we are often obliged, not simply to depend on evidence passed on by others, but to rely on the opinions of experts on arcane matters about which we know too little to judge for ourselves. If you aren’t familiar with the relevant vocabulary, or don’t know the relevant facts, then—like a monolingual Tagalog speaker trying to assess the reasonableness of an entry in an English crossword



puzzle in which all the clues are puns drawn from Shakespeare's plays—you simply can't judge whether or to what degree the evidence warrants a conclusion. That's why we struggle to distinguish *real* experts from plausible but untrustworthy pseudo-experts, falling back on fallible surrogate measures like the prestige of the institution from which a supposed expert got his degree or of the journal in which his work was published.

But for all the complexity of modern life, we humans are still—well, only human. When we need to look into difficult questions, it is always tempting to cut corners; and even with the best will in the world it can be very hard to figure out where complex or ambiguous evidence points. And as Denis Diderot long ago reminded us, man is made up “of strength and weakness, of insight and blindness, of pettiness and grandeur.”<sup>22</sup> Yes, we are capable of remarkable cognitive achievements—but too often we are lazy, and jump to conclusions; too often we are biased, and ignore or conveniently forget evidence that points to facts we find unpalatable; and too often we seize on inadequate evidence that confirms our fears or serves our interests.

Scientists, too, are only human, with the same perceptual and cognitive weaknesses and limitations as the rest of us, and the same tendencies to corner-cutting and wishful or fearful thinking. Over time, however, the sciences have developed tools to overcome perceptual and cognitive limitations—telescopes, microscopes, mathematical and statistical techniques, computer simulation methods, etc.; and internal social mechanisms by means of which the natural-scientific community, at least, has managed to keep most of its members, most of the time, reasonably honest—an ethos that rewards real achievement, encourages evidence-sharing, and discourages cheating, as well as more formal mechanisms like the peer-review process for distributing research funds and screening publication.<sup>23</sup>

But while those technical scientific tools generally get better and better, the social mechanisms keeping scientists honest do not; in fact, they are now under severe strain as scientists find themselves ever more urgently required to get grants, to publish, etc. And the strain is worst precisely where the scientific work concerned is of most public interest: e.g., in climate science and the medical sciences—where media reports seize on newsworthy scientific results, but omit important caveats and limitations, and politicians seize on those reports to drum up support for their policies. It's hardly surprising that some scientists succumb to the

temptation to fudge, exaggerate, or even fabricate.<sup>24</sup>

Much of the scientific work we read about in the press is largely speculative, and will probably come to nothing; and on many questions scientific opinion is as yet unsettled. We often over-estimate how well we understand arcane, complex evidence, and jump to unwarranted conclusions; or under-estimate what we can figure out if we try, and throw up our hands in despair, meekly accepting whatever any self-styled expert tells us. But when there is unresolved scientific controversy in an unfamiliar field, the reasonable response is to acknowledge that you aren't entitled to an opinion; and, by contrast, when, say, a medical study was based, not on physicians' diagnoses, but on patients' own reports of what was wrong with them, you don't need to be an expert to spot problems.

Here is Mill once more: "[epistemology] does not give ... proofs, but teaches what makes them proofs, and how to judge of them."<sup>25</sup> Again, he's right; epistemological theory can tell us what makes evidence better or worse, but not whether or to what degree a claim is warranted or a scientific study methodologically flawed. A crash course in epistemology won't magically turn you into an expert on everything, nor enable you to assess arcane evidence, spot technical design flaws in a scientific study, or discriminate reliable experts from unreliable in an unfamiliar field. But (good) epistemology *can* help you understand what goes wrong when your efforts to appraise evidence go awry, when you mistake a charlatan or clever self-promoter for a serious inquirer, etc.

As we have seen, there are many ways to get into epistemological trouble: misconstruing what the evidence is, or what is relevant to what; focusing on readily available evidence and forgetting about other potentially relevant evidence we *don't* have; misjudging how well the evidence we have warrants a conclusion, perhaps allowing our wishes or our fears to color our judgment; failing to realize that information has been lost or distorted in the transmission process, or that those on whom we are relying have allowed *their* judgment of the weight of evidence to be colored by *their* hopes or fears; or simply being reluctant to admit that we were mistaken, or that we just don't know.

With these thoughts in mind, I return to that recent article in a leading British medical journal, *The Lancet*, arguing that there is empirical evidence for allocating scarce medical resources to adolescents and young adults rather than infants or older people.<sup>26</sup> Reading the article itself (rather than just press reports), you soon learn that this "evidence" consists of surveys showing that *most people think* that this is how such resources should be

allocated. But information about what most people think is best can't possibly tell us what *is* best. And anyway, digging a little deeper, you soon discover that this supposed evidence is far from secure: only two studies are cited; one is unpublished, and neither says exactly what the authors of the *Lancet* article claim.

What about "evidence-based medicine"? This certainly sounds like a good thing—who *wouldn't* prefer to know before they take it that this medicine will make them better, and won't kill them in the process? And indeed, evidence-based medicine *is* a good thing—if "evidence-based" means "taking into account all the relevant evidence we have, or can obtain." But things go wrong when the entirely reasonable idea that we should prefer medical treatment which there is evidence to believe is both effective and safe is covertly transmuted into the much less reasonable idea that we should prefer medical treatments supported by a restricted *kind* of evidence—epidemiological studies and clinical trials. This is classic bait-and-switch: first appeal to our sense that evidence matters, and then covertly allow only evidence of certain preferred kinds.

Epidemiological evidence and clinical trials aren't the *only* evidence relevant to assessing the value of a medical treatment. Information about, e.g., the effects of a drug on animals is also relevant; as are physicians' observations of which patients respond well to a treatment, and which badly or not at all—which can complement the evidence about large classes of people that epidemiological studies and clinical trials provide with evidence of possibly-relevant individual variations. And epidemiological studies and clinical trials aren't always *good* evidence, either, but may be flawed in design, execution, or both. The only epidemiological study to suggest that silicone breast-implants cause connective-tissue disorders relied entirely on women's own reports of their (supposed) medical problems;<sup>27</sup> the VIGOR trial, on the basis of which Merck got FDA<sup>28</sup> approval to market its blockbuster arthritis drug Vioxx, was designed to record the gastrointestinal effects of the drug, which the company had reason to believe would be benign, for longer than it recorded cardiovascular effects<sup>29</sup>—effects that subsequently proved so bad that the drug had to be withdrawn from the market.

A busy physician, if he doesn't simply rely on what drug-company reps tell him, probably reads at most the abstracts of papers in the medical journals; and may simply assume that the peer-review process will screen out poor work.<sup>30</sup> But the referees for the highly prestigious *New England Journal of Medicine*, where the report of the VIGOR trial appeared, didn't

notice the flaw in its design; nor, later, did other referees notice that the authors of the APPROVe study, on the basis of which the drug was withdrawn, didn't actually use the statistical methods they claimed they did.<sup>31</sup> And the breast-implant example illustrates what happens when people's appraisal of evidence is colored by fear: an attention-getting television program led many women with silicone implants to worry that the slightest twinge was the first sign of serious trouble; and attorneys soon cashed in, signing up scads of breast-implant clients.<sup>32</sup>

The imbroglio over MMR vaccine and autism is even more disturbing. In 1998, a scary paper in *The Lancet* by Dr. Andrew Wakefield *et al.* suggested that this vaccine might cause a new syndrome of bowel disease and autism.<sup>33</sup> The press soon picked up the story; many parents became afraid to have their children vaccinated; and the rate of measles and other preventable children's illnesses rose.<sup>34</sup> But it should have been clear even to a lay reader that Dr. Wakefield's study was flawed: there were no control subjects; the study was based on only twelve children—eight of whom (Wakefield claimed) had developed autism after their MMR vaccination; and it relied on what parents could recall about when their children's symptoms first appeared. Critics soon pointed out these and other defects; and new epidemiological studies failed to find any correlation between the vaccine and autism.<sup>35</sup>

In 2004, investigative journalist Brian Deer noted Wakefield's involvement with attorneys for parents suing the vaccine manufacturers, and suggested that his study had violated ethical rules.<sup>36</sup> The General Medical Council (GMC: the body that regulates the medical profession in the U.K.) launched an investigation. And then, another twist: in the course of the ethics hearing, the children's medical records were made public; and Deer discovered that in all twelve cases there were significant discrepancies between the children's records and Wakefield's descriptions: e.g., some of the children had shown signs of autism before they were vaccinated, and others never had autism at all.<sup>37</sup> In short, Wakefield's work seems to have been, not just flawed, but fraudulent. In 2010, the GMC barred Wakefield from practicing medicine in the U.K.,<sup>38</sup> and *The Lancet* retracted his paper.<sup>39</sup>

The twelve other medical scientists whose names appeared on Wakefield's paper as co-authors—perhaps over-anxious to add to their resumé—had lent their authority to a final version of the paper that Wakefield wrote alone; and Robin Horton, the editor of *The Lancet*, was apparently too keen to make a splash: four of six referees had advised

him to reject Wakefield's paper, but he accepted it anyway, thinking it "provocative."<sup>40</sup> The Vioxx saga reminds us that the peer-review process is a very fallible quality-control mechanism; the MMR vaccine saga reminds us that not all the work published in peer-reviewed journals has actually passed reviewers' scrutiny—and that not all the "authors" of an article may know what's actually in it.

And then—the last example I have room for—there's the debacle known in the U.S. as "Climategate"<sup>41</sup> Those of us in the humanities and the social sciences are painfully aware that in our fields peer review can be incompetent, distorted by the influence of cliques, or even outright corrupt. For us, the discovery of thousands of e-mails from well-established climate scientists conspiring to exclude dissenters' work from the journals,<sup>42</sup> though very disappointing, wasn't altogether shocking. The scientific peer-review process is, probably, a somewhat better quality-control mechanism than, say, the philosophical peer-review process, but it too is vulnerable to corruption; and the danger is most acute in an area where passions run high, as they do in climate science.

To be sure, that there were efforts to suppress dissent from the prevailing view of global warming and its causes doesn't show that this view is false. Neither, however, does the fact that several inquiries<sup>43</sup> (or perhaps "inquiries")<sup>44</sup> into the affair reached reassuring conclusions show that the prevailing view is true. I struggled with an article by a professor of meteorology at the Massachusetts Institute of Technology: "the potential ... for alarm enters with the issue of climate sensitivity ..., the change that a doubling of CO<sub>2</sub> will produce in the GATA" [globally averaged temperature anomaly]; but "the quality of the data is poor, ... and because the changes are small, it is easy to nudge such data a few tenths of a degree in any direction"; "the question remains as to whether water vapor or clouds have positive or negative feedbacks"; etc., etc.<sup>45</sup> I picked up a few words of pidgin Tagalog in the process, but soon realized I don't know enough of the relevant science to understand Prof. Lindgren's argument adequately, or to form even a tentative opinion of my own. This is especially disturbing because I really don't know, either, whether those hacked e-mails indicated a comparatively small problem with a few over-zealous scientists, or were symptomatic of a much more troubling, systemic problem. *Qua* epistemologist, I can't help wishing that this field were—well, if you'll pardon the pun, less heated.

But can't we, by now, at least be sure that vaccines and breast implants are harmless? We can be confident that the supposed evidence

of a connection between silicone breast-implants and connective-tissue disorders was flimsy; but it doesn't follow that breast implants carry no dangers. In fact, just as I was writing this paper the FDA issued a warning that, in a very few cases, breast implants may be linked with a rare form of cancer.<sup>46</sup> We can be confident that the supposed evidence of a connection between MMR vaccine, bowel disorders, and autism was fraudulent; but again, it doesn't follow that vaccines carry no dangers. We know they do: e.g., in 1976 the U.S. had to halt a massive program of vaccinations against swine flu because of a significant increase in cases of Guillian-Barré syndrome among those recently vaccinated.<sup>47</sup>

Indeed, the discovery of Wakefield's fraud doesn't even show that there is no connection between vaccines and autism. The number of children diagnosed with autism has risen over a period in which more comprehensive childhood vaccinations have become routine; and some scientists conjecture that the mercury in thimerosal (a compound used to preserve vaccines) may be implicated. In 2004, the U.S. Institute of Medicine concluded that this idea was "to date, ... theoretical only"<sup>48</sup>—there was no evidence to warrant it. But controversy still simmers; especially since 2007, when, granting Hannah Poling's parents compensation from the federal vaccine injury fund, the U.S. government acknowledged that thimerosal had contributed indirectly to the child's autism by exacerbating an underlying mitochondrial disorder.<sup>49</sup>

Here too passions run high, both among those alarmed that the rate of vaccination against childhood diseases may fall so low as to threaten new epidemics, and among those alarmed by what seems to be a significant rise in the rate of autism. If I had to guess, I'd say there *might* be a danger to a few children with special susceptibilities. (And if I had to decide whether to have my child vaccinated, I might ask for single-dose vaccine, without preservatives, *just in case*.) But all I really *know* is that I don't know enough even to be sure how much of the apparent increase in the rate of autism is an illusion attributable to the adoption of an ampler definition that now includes a broad range of "autism-spectrum disorders"; let alone whether, if there *is* a significant real increase, what the evidence might eventually indicate about its cause(s). In short, again I don't know enough to be entitled to an opinion.

And now I'm back where I began—with Rumsfeld's "unknown unknowns." So here, at last, is my take on his epistemological point. To assess how good the evidence was that, e.g., Saddam Hussein had weapons of mass destruction, U.S. intelligence services needed to know

not only where the available evidence [the “knowns”] pointed, and how secure it was, but also how comprehensive it was; and to do that, they needed to know what relevant evidence there might be that they *didn't* have [the “unknowns”]. Unfortunately, though they knew what some of the relevant evidence was that they needed but didn't have [the “known unknowns”], they didn't realize that *other* evidence, evidence they also didn't have, was also relevant [the “unknown unknowns”]. There is a lesson here for us all.<sup>50</sup>

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### References and Notes

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6. Richard Rorty, “Science as Solidarity,” in John S. Nelson, Allan Megill, and Donald M. McCloskey, eds., *The Rhetoric of the Human Sciences* (Madison, WI: University of Wisconsin Press, 1987), 38-52, pp. 44, 40, 45.
7. Jonathan Rauch, *Kindly Inquisitors: The New Attacks on Free Thought* (Chicago: University of Chicago Press, 1993), p. 35.
8. Mill, *System of Logic* (note 3 above), p. 6. (The word Mill uses is not “epistemology,” which at the time had not yet come into currency, but “logic,” which, as his subtitle indicates, was then used much more broadly than is now usual, to include what would now be called “epistemology.”)
9. W. K. Clifford, “The Ethics of Belief” (1876), in Timothy J. Madigan, ed., *The Ethics of Belief and Other Essays* (Amherst, NY: Prometheus Books, 1999), 70-96, p. 77.
10. Percy W. Bridgman, “The Struggle for Intellectual Integrity” (1933), in Bridgman, *Reflections of a Physicist* (New York: Philosophical Library, 1955), 361-79, p. 368.
11. Scott Turow, *Reversible Errors* (New York: Warner Vision Books, 2002).
12. Michael Frayn, *Headlong* (New York: Picador), 1999.
13. Arthur Hailey, *Strong Medicine* (London: Pan Books, 1984).
14. “Social epistemology” is now fashionable; but so far as I can tell, there is as yet no well-developed body of theory here.

15. Nicholas Rescher, *The Strife of Systems* (Oxford: Oxford University Press, 1985), p. 3.
16. DNA evidence indicates that some male of the Jefferson family was the father of one of these children. William G. Hyland, *In Defense of Thomas Jefferson: The Sally Hemings Sex Scandal* (New York: Thomas Dunne Books, 2009).
17. See Susan Haack, "Confessions of an Old-Fashioned Prig" and "Preposterism and Its Consequences," in Haack, *Manifesto of a Passionate Moderate: Unfashionable Essays* (Chicago: University of Chicago Press, 1998), 7-30, 88-208.
18. According to a 2005 study, more than 27% of scientists polled admitted keeping inadequate records. Brian C. Martinson et al., "Scientists Behaving Badly," *Nature* 435, no.9 (2005): 737-8.
19. Susan Haack, *Evidence and Inquiry* (1993); 2nd, expanded ed. (Amherst, NY: Prometheus Books, 2009).
20. The tragic story is told in Trent D. Stephens and Rock Brynner, *Dark Remedy: The Impact of Thalidomide and Its Revival as a Vital Medicine* (Cambridge, MA: Perseus Publishing, 2001).
21. Social aspects of the theory presented in *Evidence and Inquiry* (note 19 above) are developed in my *Defending Science—Within Reason: Between Scientism and Cynicism* (Amherst, NY: Prometheus Books, 2003), chapter 3.
22. Denis Diderot, *Addition aux pensées philosophiques* (c.1762), in *The Oxford Book of Aphorisms*, ed. John Gross (Oxford: Oxford University Press, 1983), pp .24-5.
23. See *Defending Science* (note 21 above) chapter 4.
24. *Id.*, chapter 7.
25. Mill, *System of Logic* (note 3 above), p. 5.
26. Govind Persad, Alan Wertheimer, and Ezekiel J. Emmanuel, "Principles for Allocation of Scarce Medical Resources," *The Lancet* 373 (2009): 432-32.
27. Charles H. Henneckens et al., "Self-Reported Breast Implants and Connective Tissue Diseases in Female Health Professionals," *Journal of the American Medical Association* 275 (1996): 616-621.
28. Food and Drug Administration, the federal regulatory body that determines whether a drug or medical device has been proven safe and effective, and may be marketed in the U.S.
29. Claire Bombadier et al., "Comparison of Upper Gastrointestinal Toxicity of Rofecoxib [Vioxx] and Naproxen in Patients with Rheumatoid Arthritis," *New England Journal of Medicine* 343, no.21 (2000): 1520-28. David Armstrong, "How the New England Journal Missed Warning Signs on Vioxx: Medical Journal Waited Years to Report Flaws in Article that Praised Pin Drug," *Wall Street Journal*, 11 May 2006, A1, A11.
30. On the peer-review system generally, see Haack, "Peer Review and Publication: Lessons for Lawyers," *Stetson Law Review* 36, no.3 (2007): 789-819; reprinted in Susan Haack, *Evidence Matters: Science, Truth, and Proof in the Law* (New York: Cambridge University Press, 2014), 156-79.
31. Heather Won Tesoriero, "Vioxx Correction May Add Pressure to Merck's Defense," *Wall Street Journal*, 27 June 2006, p. A2. See also my "The Integrity of Science: What It Means, Why It Matters" (2006), in *Putting Philosophy to Work: Inquiry and its Place in Culture* (Amherst, NY: Prometheus Books, 2008; expanded ed., 2013), 121-41 (text) and 283-88



- (notes).
32. See Marcia Angell, *Science on Trial: The Clash of Medical Evidence and the Law in the Breast Implant Case* (New York: W. W. Norton, 1996).
  33. Andrew Wakefield et al., "Ileal-lymphoid-nodular Hyperplasia, Non-specific Colitis, and Pervasive Developmental Disorder in Children," *The Lancet* 351 (February 28th, 1998): 637-41.
  34. Editors of the British Medical Journal, "Wakefield Article Linking MMR Vaccine and Autism was Fraudulent," *British Medical Journal* 342 (2011): 64-6. (After the scare, the incidence of measles rose significantly in the U.K. and the U.S.; I don't know what happened elsewhere.)
  35. Id.
  36. Brian Deer, "Revealed: MMR Research Scandal," *Times Online* (London), February 22, 2004, [http://www.timesonline.co.uk/tol/life\\_and\\_style/health/article1027636.ece](http://www.timesonline.co.uk/tol/life_and_style/health/article1027636.ece) (last visited January 27, 2011).
  37. Brian Deer, "How the Case against the MMR Vaccine was Fixed," *British Medical Journal* 342 (2011): 77-82.
  38. Andy Coghlan, "Banned: Doctor Who Linked MMR Vaccine with Autism" *New Scientist*, 18 (May 24, 2010): 18.
  39. Editors of *The Lancet*, "Retraction—Ileal-lymphoid-nodular Hyperplasia, Non-specific Colitis, and Pervasive Developmental Disorder in Children," *The Lancet* 375 (2010): 445.
  40. Paul A. Offit, "Junk Science Isn't a Victimless Crime," *Wall Street Journal*, January 11, 2011, A17.
  41. Because, since the Nixon-era Watergate scandal (named after the building in which the shenanigans took place), "gate" has become a generic word for "scandal" — as in "zippergate," referring to the scandal over Bill Clinton and Monica Lewinsky.
  42. Keith Johnson, "Climate Strife Comes to Light," *Wall Street Journal*, November 23, 2009, A3.
  43. See Jeffrey Ball and Guy Chazan, "Report Backs Climate Data, Scolds Scientists," *Wall Street Journal*, July 8, 2010, A13.
  44. See Patrick J. Michaels, "The Climategate Whitewash Continues," *Wall Street Journal*, July 12, 2010, A15.
  45. Richard S. Lindgren, "The Climate Science Isn't Settled," *Wall Street Journal*, December 1, 2009, A19.
  46. Jennifer Corbett Dooren and Alicia Mundy, "Implants, Cancer May be Linked," *Wall Street Journal*, January 27, 2011, A6.
  47. David A. Freeman and Philip B. Stark, "The Swine Flu Vaccine and Guillain-Barré Syndrome: A Case Study in Relative Risk and Specific Causation," *Law and Contemporary Problems* 64. no.4 (2001): 49-62, p. 52.
  48. National Institute of Medicine, *Immunization Safety Review* (Washington, D.C., 2004), p.152.
  49. Thomas L. Hofmeister, "Government Agrees to Compensate Family that Claims Childhood Vaccinations Caused Autism," *Developments in Mental Health Law* 27 (2008): 71-3. Three other test cases decided in 2009 held that the evidence showed neither that MMR vaccine causes autism, nor that thimerosal does.
  50. My thanks to Mark Migotti for helpful comments on a draft, and Pamela Lucken for help in finding relevant materials.