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**Defending Limited Non-Deference to Science Experts**

Larry Lengbeyer

Associate Professor of Philosophy, United States Naval Academy

beyer@post.harvard.edu

ABSTRACT FOR CONFERENCE APPLICATION: Scientists and their supporters often portray as exasperatingly irrational all those laypersons who refuse to accede to practical recommendations issued by expert scientists and 'science appliers' (e.g., public health authorities and regulators). After first considering the latter groups’ standard explanations for such non-deference, which focus upon irrationalities besetting the laity, I will propose that a better explanation for at least some of the non-deference is that many laypersons are rationally electing to substitute their own judgments for those urged upon them by the scientific community.

Science-based recommendations, as I treat them, have the general form

*In light of the science on X, if you seek outcome O, you ought to V*.

Non-deferring laypersons deny the soundness or cogency of the *V*-supporting argumentation—though they are supposedly not competent to do so, given their gross epistemic inferiority to the scientific authorities who create and endorse the arguments. On account of thus being epistemically irrational, they end up being instrumentally irrational, pursuing courses of action that are poor choices for serving their own interests (as well as broader societal interests).

The non-deferring laypersons are thought to violate two mandates of rationality: for *internal deference* to the underlying science as true (or probable) enough to constitute an unproblematic background for decisionmaking, and for *external deference* to the practical application of that science to the concrete extra-scientific circumstances in question. I claim that rationality does not require categorical adherence to these mandates.

In any given case, non-deference by some laypersons might be warranted by one or more of four distinct rationales.

1. *Value-ladenness*: The science-based recommendation discernibly (to these laypersons) includes non-scientific (political, legal, moral, or prudential) value-choice or value-weighting assumptions. It embodies a certain prioritizing of the plurality of specific values packed within its *O* parameter (which is typically stated either generally, e.g. “health” or “safety,” or not at all), and some laypersons may permissibly substitute their own.
2. *Non-scientific-reasoning-ladenness*: The science-based recommendation discernibly (to these laypersons) relies upon reasoning moves that are not distinctive to science, moves whose critical assessment demands no scientific expertise. Error-free reasoning is difficult to attain, and the laypersons may justifiably take themselves to have found weaknesses in the *V*-supporting argumentation that undermine the case for conformity to the recommendation.
3. *Overgeneralization/Overaggregation*: The science-based recommendation discernibly (to these laypersons) is guilty of overgeneralization—or, better said, are not adequately tailored to the specific situation of the laypersons in question.
4. *Untrustworthy science*: The science-based recommendation discernibly (to these laypersons) is based upon scientific research that is of doubtful quality.

The first three rationales cast doubt upon the External Deference Mandate, questioning not the existence of sound underlying research but the recommendation’s judgments about how this research ought to be applied. The fourth is a challenge to the Internal Deference Mandate, and is more difficult to sustain.

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 Public controversies on science-related policy questions are resisting resolution and corroding social cooperation. Laypersons seem increasingly to refuse to defer to the expert judgments, recommendations, and edicts of the scientific community of scientists and 'science appliers' (public health authorities, regulators, medical doctors, and others who draw upon the results of scientific inquiry in their decisionmaking). What explains this?

 The standard explanations focus upon irrationalities besetting the laity. For how could *rational* laypersons not concede the thorough asymmetry between themselves and the scientific experts regarding access to truth? Non-deferring laypersons *must be* suffering from amazing ignorance of their basic epistemic limitations, and/or deficiencies in logical reasoning, and/or—since, after all, much of the lay ‘resistance’ comes from people who are well educated and often even intellectually sophisticated and self-aware—maybe unnoticed but powerful mental biases, and/or uncontrollable ideological rigidities—along, of course, with an unawareness that they are beset by these shortcomings.[[1]](#footnote-1)

 I propose that a better explanation for at least some of the decline in deference is that many laypersons are *rationally* electing to substitute their own judgments for those urged upon them by the scientific community. I have no aim to defend *all* lay non-deference to scientific experts, or to question the charge that some of this opposition is underlain by irrationality. I merely wish to ask whether not all of it is, whether some it might be defended as rational.

 Science-based recommendations, as I treat them here, have the general form

***'In light of the science on X, if you seek outcome O, you ought to V.'***

They commonly include explicit conclusion-supporting arguments from scientific and non-scientific premises. Non-deferring laypersons deny the soundness or cogency of the *V*-supporting argumentation—though they are supposedly not competent to do so, given their gross epistemic inferiority to the scientific authorities who create and endorse the arguments. On account of thus being ***epistemically* irrational[[2]](#footnote-2)**, they end up being ***instrumentally* irrational**, pursuing courses of action that are poor choices for serving their own interests, such as health (as well as broader societal interests).

 The non-deferring laypersons are thought to violate two **mandates of rationality**: for ***internal deference*** to the underlying science as true (or probable) enough to constitute an unproblematic background for decisionmaking, and for ***external deference*** to the practical *application* of that science to the concrete extra-scientific circumstances in question. The conceptual distinction will prove not to be a sharp one, but it serves well enough as an organizational tool. My claim is that rationality does not require categorical adherence to these mandates, nor therefore to the pronouncements of science-based authorities. The abstract for this talk, reprinted on the handout, lists the 4 grounds for non-deference to science-based recommendations: their value-ladenness, their non-scientific-reasoning-ladenness. their inapplicability due to overgeneralization, and their dependence upon untrustworthy science. Following that order, I will start with the rationales pertaining to the external deference mandate and work back to the internal one.

1. *Value-ladenness*: The science-based recommendation discernibly (to these laypersons) includes non-scientific (political, legal, moral, or prudential) value-choice or value-weighting assumptions. It embodies a certain prioritizing of the plurality of specific values packed within its *O* parameter (which is typically stated either generally, e.g. “health” or “safety,” or not at all), and some laypersons may permissibly substitute their own.
2. *Non-scientific-reasoning-ladenness*: The science-based recommendation discernibly (to these laypersons) relies upon reasoning moves that are not distinctive to science, moves whose critical assessment demands no scientific expertise. Error-free reasoning is difficult to attain, and the laypersons may justifiably take themselves to have found weaknesses in the *V*-supporting argumentation that undermine the case for conformity to the recommendation.
3. *Overgeneralization*: The science-based recommendation discernibly (to these laypersons) is guilty of overgeneralization—or, better said, are not adequately tailored to the specific situation of the laypersons in question.
4. *Untrustworthy science*: The science-based recommendation discernibly (to these laypersons) is based upon scientific research that is of doubtful quality.

I hope to say something about all 4 of these, albeit necessarily rather superficially, given our time constraints. Let’s begin with value-ladenness.

 As with each of the first 3 rationales for non-deference, the laypersons relying upon **value-ladenness** can grant the existence of an impassable epistemic gulf between them and the science experts when it comes to the *science* underpinning a science-based recommendation.[[3]](#footnote-3)

 But the gloves come off when the focus shifts to rendering *extra-scientific* **practical judgments that incorporate non-scientific elements** such as political, legal, moral, or prudential values, weightings, and priorities. Here, the lay outsiders are epistemic peers of the scientists and science appliers. They can be completely ignorant of the science, having to blindly accept the (most reliable) experts’ statements about the scientific realities, yet still be in the position to make informed and intelligent judgments about how the science ought to be, or not be, **applied** in their lives or in the lives of the collectivities to which they belong.[[4]](#footnote-4)

 To take an example from the field of public health: Even supposing that the science experts are factually correct in their statements about the grave risks of drinking **raw, ie unpasteurized or unsterilized, milk**, they have no privileged position when it comes to making risk assessments relative to the value systems of particular citizens (or groups). These experts are thoroughly uninformed about those value systems; even were they to have some information about them, the systems are liable to be so complicated and subtle that their ‘owners’ must be acknowledged to be the only experts in their application, even if that expertise is manifested only intuitively and cannot be articulated in explicit principles.[[5]](#footnote-5) A given value system might place uncommonly high weight upon ***sensory pleasure*** (and find a great taste advantage in raw milk, even if the studies find this to be uncommon or theoretically inexplicable); it might care greatly about ***political* and *ethical* dimensions** of action; it might employ practical reasoning that **discounts** what are taken to be reasonably relatively quite small ***health* *risks*** from consuming raw foods—as it accepts the risks with raw spinach, raw meat, or raw fish, all of which result in illness outbreaks that on some criteria are at least as bad as those due to raw milk.

 Or take a more familiar health topic: **vaccination**. Parents who elect not to defer to the public-health recommendations for vaccinating themselves or their children are widely condemned as irrational, as well as immoral. Yet an individual’s rational choice to vaccinate will turn upon an assessment not only of the scientifically established likelihoods of **infection** if unvaccinated vs. if vaccinated, of various possible **complications** from such infections, and of various harmful **side-effects** from the vaccination itself, but also of the negative ***value*** to be assigned to succumbing to a particular disease, and to each of the possible complications and side-effects. (The case of vaccination is particularly interesting because a complete rational calculus will also encompass the likelihood that one’s own non-vaccination might increase the risk to others, and the *moral value* that one places upon bringing about that risk.[[6]](#footnote-6)) Now, on what grounds can scientific experts claim to have epistemically privileged positions for forming judgments for individual laypersons that weight and blend these multiple kinds of value estimates? Some laypersons might be content to defer to the application judgments of the science appliers, preferring this to facing a daunting challenge of thinking through the issues and options themselves. This can itself be a rational choice. But it is not the only rational choice here.

 The value-ladenness rationale for non-deference does not depend upon the population-wide aims of science-based policymaking; it is present even where science is deployed to guide a single decisionmaker. Suppose that a **professional sports team** hires scientific experts to direct its annual draft of upcoming student players.[[7]](#footnote-7) However rigorous the science deployed, it will be unable to dictate the rational decisions by the team, if such decisions seek, as these almost invariably do, to strike a balance among multiple underlying and competing objectives—sporting objectives, financial ones, societal ones.[[8]](#footnote-8)

 In effect, we are **unpacking the** **“outcome O”** term in the standard form of science-based recommendation, 'In light of the science on X, if you seek outcome O, you ought to V.' The O parameter is sometimes left unstated, or more commonly is stated only in general terms, like “health” or “safety” or “best educational outcomes,” that hide the plurality of specific values underneath, as well as the perspectival variation across the targeted population. What is layperson L seeking to optimize: longevity? some measure of health? quality of life, conceived in some particular fashion (pleasure/pain; independence/autonomy; vitality/vigor; maintenance and enjoyment of important personal relationships; etc., etc.)? quality of expected death? continuity, not having to make substantial life changes? not having to make large investments of time, strenuous effort, pain, worry, money?[[9]](#footnote-9)

 The lay target of a science-based recommendation may thus be aware that various choice options facing her present various collections of **tradeoffs across multiple values**, and that the recommendation implicitly prioritizes some over others in a way that she find intuitively uncongenial or troubling. Rationality certainly cannot dictate that she surrender her own view of the tradeoffs in order to adopt that of the scientific experts.[[10]](#footnote-10)

 The **second** challenge to the External Deference Mandate derives from **the nature of reasoning**. Scientific research relies heavily, probably far more heavily than most scientists themselves are aware, upon ***modes of reasoning that are not specific to science***. Reasoning is very difficult, in several senses—it can be arduous, even painful—but most important is that it's very hard to get right and to know that one has got it right. Moreover, it’s very challenging to see when *others* have gotten, or not gotten, it right—such issues so often go entirely unnoticed—or even, in many cases, to figure this out once the question has been explicitly raised.

 And reasoning is really hard in these ways for *everyone*, or nearly everyone. It is incredibly cognitively demanding. No one, or nearly no one, does this in a way that is beyond criticism. Even the upper echelons of those groups whose vocations depend greatly upon reasoning skill, like philosophers and lawyers, struggle endlessly with these difficulties. Most important for our purposes, *scientists* are not experts in general reasoning.

 Now, if scientists’ general reasonings are not distinctively reliable—and we have no evident reason to take them to be so—then the inferences that they draw, and include in their recommendations, deserve to be scrutinized carefully by laypersons, especially when the stakes of compliance or noncompliance are perceived to be high. If laypersons locate flaws in the science-based arguments (especially flaws whose existence they can *confirm* through consultation with other generally-perceptive reasoners whom they have no reason to regard as particularly biased in the case at hand), and if those flaws logically weaken the case for the recommendation, then the rationale for deference to it is likewise weakened.

 Where might we expect to find, in the arguments for science-based recommendations, reasoning moves that are largely or entirely expertise-independent and thus properly accessible to layperson assessment? Consider some illustrative cases, some made up and some not:

* “You wouldn't feed your kids cow poop, so why would you feed them **raw milk**?” (questionable analogy, arousing misleading and prejudicial associations)
* “If you feed your children raw milk, you're putting them at grave risk” (equivocation between high probability and serious possible consequences)
* “[M]edical facts show there is no evidence to support the argument that **vaccinations** aren’t safe” (most charitably, an equivocation between different senses of “aren’t safe,” from a *Washington Post* essay by the *director of the Cleveland Clinic's Center for Ethics, Humanities and Spiritual Care*)
* “You can ignore the recommended vaccination schedule for your children, or you can keep them safe” (emotional appeal; false dichotomy)
* “The anti-vaccination movement is … based on myths that have been perpetuated by the power of the Internet and endorsements from celebrities such as actress Jenny McCarthy, who has suggested that vaccinations may have caused her son’s autism.” (ad hominem, damning an entire position by the association with celebrity culture, from a *Washington Post* essay by the *director of the Cleveland Clinic's Center for Ethics, Humanities and Spiritual Care*)
* “The midwives who advocate for **home birthing** lack the training of obstetricians” (suggesting that this lack makes them less knowledgeable about birthing processes and options)
* “The idea that skeptical climate scientists are being treated like Soviet geneticists in the Stalinist period [in the Lysenko Affair] has no basis in fact. There are no political or scientific dictators in the US. No climate scientist has been expelled from the US National Academy of Sciences. No skeptics have been arrested or banished to gulags or the modern equivalents of Siberia.” (straw man, from a *New York Review of Books* essay by William D. Nordhaus, Sterling Professor of Economics at Yale, defending climate science from the charge of herd mentality or groupthink)

The point is *not* that these arguments have no place in public debate, or that there is only one rational way to evaluate them, the way that leads to skepticism of science-based recommendations. Rather, the point is that these sorts of reasonings are amenable to critical analysis by laypersons, and that consequent upon such analysis some of these laypersons could be rationally justified in deciding to withhold their deference from the associated recommendations.

 One way to describe the insight here is that epistemic credentials are ***multi-dimensional***. Jane may well be John’s epistemic inferior insofar as she is aware of much less evidence, has less training and experience, and is even less clever; yet the tasks of reasoning and interpretation are so complicated that it ought not be surprising if Jane possesses knowledge, insights, or criticisms that John has not noticed and that he can learn from. Scientists ought to hesitate to dismiss someone who disagrees with them just because that person is less well-trained or knowledgeable, for she still might have insights that they lack, or see problems with their position that they cannot.[[11]](#footnote-11) Scientific expertise, as fine and valuable as it is, buys only so much. It does not cover all the matters that are relevant to assessing a science-based recommendation.

 The **third** rationale for non-deference is actually a subset of the second that deserves separate attention, a particular kind of reasoning that lies behind many science-based recommendations yet is vulnerable to critical assessment by laypersons. It is the extraction of *general* prescriptions from evidence and analysis that may not warrant this. Some recommendations can be rationally disregarded on grounds that they are not adequately tailored to the specific situations of the laypersons in question.

 Several related phenomena of **overgeneralization** can be distinguished. For one, there is the fact that science-based recommendations are devised for *populations*, not individuals.

 Thus, public health authorities strongly advise that all preteens receive the **HPV vaccine** as protection against cancers caused by human papillomavirus (HPV) infection.[[12]](#footnote-12) Current evidence suggests that HPV is transmitted mainly through oral sex, though there are some studies that suggest that kissing might transmit the virus. While widespread vaccination of preteens might be the safest overall course *for a population*, a child who is known not to be ‘at risk’ for engaging in any of the HPV-transmission behaviors might be well-advised to delay in getting the vaccine. Similarly, the **vaccine against Hepatitis B** is recommended[[13]](#footnote-13) for *babies*, even though the main vector of disease transmission is unprotected sex.[[14]](#footnote-14) Public health authorities might rationally be concerned about the predictable portion of the population that will not show up for medical evaluations when older, and will begin sexual activity without immunization; but an individual family might regard this concern as utterly inapplicable to themselves, and thus rationally disregard the recommendation.[[15]](#footnote-15)

 The issue here can be seen as one of the **proper regard for** **base rate information**. The standard concern about base rates in the heuristics-and-biases literature is, of course, base rate *neglect*—where people ignore overall background odds that apply to them, focusing disproportionate weight in their calculations upon certain particulars. In effect, they create unwarranted exceptions from true generalizations for themselves. So, if people greatly overestimate their driving skill while intoxicated, they might be led to ignore guidelines for safe driving behaviors, thinking wrongly that these do not apply to them.

 But of course disregard of base rates is irrational only where the base rates *do properly apply*. Where the circumstances truly render them inapplicable, then it is **base rate *regard*** that deserves the condemnation. Base rate evidence that is not, or not wholly, relevant ought to be given discounted weight in our rational calculations.

 Thus, if studies of **co-sleeping** with infants lead to recommendations against the practice due to risk of death to the infants, but the deaths are attributable to parents who have certain characteristics that one does not share (maybe obesity and intoxication), then a blind adherence to the recommendation is epistemically irrational. One is placing excessive weight upon an irrelevant bit of evidence.

 A kind of overgeneralization that we might term **“overextrapolation”** can arise from data collection that ignores variables that plausibly might be important causal factors. For example, researchers in child psychology or health might not think to compile information about the schooling of the child subjects, or their diets, or their time spent outdoors. So can their results be trusted to extend to children who are not schooled, or who eat an uncommon diet, or who spend an abnormal amount of time outdoors? The weight to be properly placed upon a study depends upon the explanation one accepts for the phenomenon depicted in the study; if, given this explanation, the difference between one’s own situation and that of the study subjects would be expected to make a substantial difference in outcome, then it is the irrational person who would defer to the recommendation without adjustment.

 In a different twist, a research study’s *overbroad definition of the subject group* might warrant withholding one’s compliance from the recommendation derived from it. For example, if a study of potential breastfeeding benefits treats as breastfeeders any mother who nurses her newborn for at least *two days* postpartum, then a negative conclusion in the study (and any recommendation based thereon) might rationally be discounted by a woman who has nursed, or intends to nurse, her infants for at least a year.

 Yet another phenomenon of overgeneralization, which we might call **“overaggregation,”** can sometimes justify non-deference to a science-based recommendation. Many scientific studies result in a spread of outcomes, for a specific medical treatment or exercise regimen, say, but the results become collected in simplifying conclusory statements and recommendations that hide the variations. Indeed, it is not too uncommon for some experimental subjects to react to a given intervention not only to a lesser degree than average, but in the opposite way—being made sicker, for example, or to die sooner, than the majority of the subjects. Clearly, it is rational for a layperson facing a science-based recommendation to ascertain whether he might be in a subgroup that would probably benefit less, or even be likely to suffer harm, from the recommended action, and to act accordingly.[[16]](#footnote-16)

 Finally we have arrived at the most challenging case to make: that laypersons can be rationally entitled to disregard (or modify) a science-based recommendation on account of **their assessment of the underlying science** as questionable. This challenge to the *internal* deference mandate requires showing that the wall between scientific insiders and outsiders has gaps that permit outsiders[[17]](#footnote-17) to engage directly with insider scientific reasoning—for instance, to judge when and where a theory is properly applied, and where it is not; to critique a theory, imputing weaknesses or possible weaknesses to it or weighting its strengths and limitations differently from the way that (some) scientists have.

 Now, on what possible basis might a layperson legitimately claim the epistemic authority to judge and challenge internal scientific reasoning? First, note that many people nowadays are capable of locating records of internal scientific positions—finding online, say, scientists’ journal articles, conference presentation, commission reports, issue analyses, and public statements. And they are capable, in many cases, of a significant degree of comprehension of those records.[[18]](#footnote-18) Much of the time, the well-comprehended material will be so limited, or intermixed with the uncomprehended, that an outsider will lack any toehold to make an intelligent evaluation of the research. But some of the time, the outsider will have the ability to offer evaluations that deserve respect, including critical evaluations such as the following:

* the theoretical model (in psychology, say) is simplified or stylized in a way that calls into question its likely utility for some real-world applications;
* the effect sizes in the literature are small, or the sample sizes are small, or the margins of error are wide;
* the findings have not been replicated, and there may be grounds for doubting their replicability;
* the theory has been confirmed/validated in highly artificial conditions, or with a data set that is limited in important ways, calling into question its applicability to other contexts;
* the logic of the study’s method is flawed;
* the stated findings or conclusions are not convincingly warranted by the study results, on account of one or more methodological failures [overgeneralization, overstatement, cherry picking, possibly p-hacking];
* the offered explanations for the research results are not compelling on their own, or seem inferior to other possible explanations that have, or have not, been explicitly considered by the researchers;
* the logic with which some consequential inference has been drawn is faulty;
* the theory does not cohere with some seemingly-secure apparent truths about the world, or with other theories that there is good reason to accept;
* the theory is conceptually confused or internally inconsistent;
* the conclusions depend upon questionable factual assumptions;
* the conclusions depend upon trusting auxiliary theories whose roles may not have been acknowledged (or, perhaps, even recognized) by the researchers and that, in any event, have not been convincingly shown to have been thoroughly tested, or well confirmed, or superior to their competitors;
* the reasoning leans heavily upon a metaphor, analogy, or other figure of speech that has unnoticed weaknesses or cannot bear all the weight placed upon it;
* the conclusions turn on evaluations of strength of reasons or objections, and maybe combinings of plural and diverse factors (eg, in favoring one causal hypothesis over a rival), these evaluations seem seriously questionable, and their assessment seems not to be highly expertise-dependent;
* the results are from the past, leaving open questions about whether the causal mechanisms in producing such outcomes might have changed since the studies were done;
* the track record of that field casts doubt upon its supposed findings—eg, many (recent) reversals; dubious theoretical approaches that are still prevalent; exposés of false alarmist predictions, failed applications, dubious methodological practices, or non-replications;
* the implications of those study limitations acknowledged by the researchers are more severe than the researchers have granted.

 These various outsider worries about the quality of the science underlying science-based recommendations might have lesser force were there convincing evidence that the scientific community in fact does examine and respond to all such theoretical challenges.[[19]](#footnote-19) But there remain many questions about whether scientific research truly is subjected to adequate peer critique to warrant this sort of confidence. I leave discussion of that issue to another time.

**CONCLUSION**

 Many self-styled defenders of science call for a populace **better educated in science**, thinking that this will produce people who happily and humbly comply with science-based pronouncements. Now, the laity is indeed ignorant about the scientific method, but this produces an *excess* of deference, not a deficiency thereof, as there remains great ignorance about the contributions of imperfect, interested, biased, perspective-laden *human* *judgment* to scientific method. And this is compounded by an ignorance of the laity’s own capacity for more direct involvement in science-based policymaking. The typical layperson is something like the woman of 1800 who believed the (perhaps sincere) assurances of the men in her life that she did not have the necessities for having a say in political or financial or intellectual matters.

 If I am right, then the scientific world ought to take some of the medicine it prescribes to its public opponents, and **humble** itself intellectually. Acknowledging frankly the serious limitations of science (and not only the convenient one about the provisionality of its claims), and respecting non-scientists’ rightful exercise of intellectual autonomy, might enhance the credibility of the scientific community and recoup some of its lost cultural authority. Science *deserves* a good deal of deference; **science hubris and over-exclusivity** do not.

 **My position will not lead to perfect results**. Laypersons will err. They will unjustifiably overestimate their own capacities for intellectually virtuous judgment and decisionmaking. They will be mistaken about the credibility of sources, will make poor selections of sources on which to rely, will misread or misinterpret sources, will make reasoning errors, will fall prey to mental biases, and will, as a result of these mistakes, sometimes harm themselves (and others who depend upon them). How can legitimizing lay non-deference to science-appliers, then, be prudent and acceptable to those who care about such consequences?[[20]](#footnote-20) The answer turns upon **our view of the realm of lay decisionmaking** that’s involved here. Is this realm analogous to, say, a training ground for the **construction, detonation, and disarming of explosives** where novices ought to unquestioningly obey the directions of their expert overseers? Or, to the contrary, is it like a **philosopher** trying to impart, or better yet, **elicit wisdom from non-philosophers** about how to live well, where we would hope to see minimal automatic adherence to the expert’s advice, but a critical and personalized assessment and adaptation of that advice? Or is it somewhere in between, as when a **leader in the military, government, or business** issues dictates that are to be followed, but also adapted intelligently to varied circumstances and also questioned or challenged through proper channels when appropriate? Or different still from all these? In any case, non-scientists are decreasingly willing to diffidently place their personal choices in the hands of distant science-based authorities. There is likely no going back to such a world. Better to embrace the emerging **participatory model**, and to concentrate on elevating laypersons in respectful and empowering ways so that they can play their limited role competently, perhaps gradually increasing their science understanding so as to narrow the gulf between them and the experts.

1. The suggested correctives are varied: better science education; better education in (critical) thinking more generally; explicit public discussion that holds up a mirror to the lay dissenters so that they can see the error of their non-deferring ways; perhaps even legal measures that remove certain kinds of decisionmaking authority from laypersons and transfer them to government or government-licensed experts. These corrective efforts made so far have borne little fruit: louder and more emphatic assertions by the ‘science supporters’ about the expert-non-expert divide and the low quality of laypersons’ thought processes may produce in them some comforting sense of solidarity, but they only stoke their frustration with the lay target audience, who for their part respond mainly with antagonism and what they see as further, reinforcing evidence of the former’s high-handedness, groupthink, and general untrustworthiness. [↑](#footnote-ref-1)
2. They are willingly adopting and maintain beliefs/etc. on the basis of their own uninformed, untrained, and highly flawed perspectives, a much less reliable basis than is readily available to them [↑](#footnote-ref-2)
3. As far as *this* goes, she might admit, laypersons are science-insiders’ epistemic inferiors, in no way their peers, and therefore are not entitled rationally to substitute their judgments for those of scientists. They are confined, in forming rational judgments about *internal* scientific matters, to making “second-order” (Lane 2014) assessments of the insiders’ expertise, and then adopting the views of those insiders whose expertise has proven to be generally the most reliable in the relevant realm. [↑](#footnote-ref-3)
4. Of course, a lay outsider who has reason to know, or suspect, that she personally is intellectually incapable of reasoning effectively about these application matters, whether due to ignorance or incompetence or bias or anything else, ought to mistrust her own judgment here as elsewhere, and defer to someone she has good reason to believe more reliable—but scientists are no better candidates for this role than non-scientists. [↑](#footnote-ref-4)
5. Not that there would be no experts who would gladly overlook this complexity and believe themselves able to accurately model those value systems and produce choices better in keeping with them than can be produced by the systems’ owners themselves. [↑](#footnote-ref-5)
6. It is still more complicated by the facts that (i) most vaccination decisions are made not by those vaccinated, but by their guardians; and (ii) the vulnerability of others to infection from oneself or one’s own child is a function of the immunity and general health of those others, which, in the general case, is partly a function of voluntary behaviors that have been chosen by or for them. [↑](#footnote-ref-6)
7. Suppose further that these experts are able to devise ingenious ratings systems for individual players on multiple dimensions; detailed profiles of a team’s relative strengths and weaknesses, with these strengths and weaknesses shown to correlate historically with winning and losing; robust studies showing that certain kinds of drafting strategy have historically produced certain kinds of outcomes; and whatever other insightful research you can imagine. [↑](#footnote-ref-7)
8. Does the team owner or manager seek short-term success on the field, or long-term? Success on the field as measured by winning percentage, or playoff contention, or playoff appearances, or championships? What about the financial objectives—maximizing expected profit, minimizing risk? Or providing excellent role models to the team’s young fans? Or various economic and psychological benefits to the team’s city, fans and non-fans alike? [↑](#footnote-ref-8)
9. In the case of an **educational** recommendation, which goals are relevant: higher grades or standardized-test scores? greater content knowledge? mental skill? intellectual virtue? deep learning? transfer of learning to real-life contexts? long-lasting learning? psychological or social flourishing? enhanced self-learning capability? For a recommendation about sleeping or not **sleeping with one’s child**, the ‘end user’ of the science-based recommendation might reasonably be aiming not only at minimizing the risk of SIDS/crib death, but also at potential health benefits of co-sleeping for the baby, potential psychological benefits, parent-child bonding, facilitation of breastfeeding, minimal sleep interference for the parents (along with the negative consequences thereof). [↑](#footnote-ref-9)
10. This is all the more true where the layperson has good cause to believe that the recommendation has been shaped by **politics** in a way that disserves her own interests. For instance, if she has learned that **dietary recommendations** have been influenced by the lobbying of financially interested food industries (as has been the case in the USA; CITE), or by horse-trading compromises made in order to garner the necessary votes for promulgating the recommendation, and as a result the recommendations have not even fully incorporated the best judgment of the science experts (who may nonetheless endorse the imperfect pronouncement, seeing it as the best that could realistically be attained), then the rational imperative to defer is defeated even more thoroughly. [↑](#footnote-ref-10)
11. For example, an inquisitive and careful layperson might well be capable of reading the psychology literature and spotting some dubious reasoning or overlooked possibilities; even a technical bioscience paper may contain a discussion of research implications and limitations that is accessible to her critical faculties. [↑](#footnote-ref-11)
12. <http://www.cdc.gov/vaccines/who/teens/vaccines/hpv.html>. [↑](#footnote-ref-12)
13. <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/hep-b.pdf>. [↑](#footnote-ref-13)
14. Other modes of transmission are easily protected against: <http://www.webmd.com/hepatitis/hepb-guide/hepatitis-b-topic-overview>. [↑](#footnote-ref-14)
15. Another case: automatic **beta strep** treatment pre-birth, even in circumstances where it is irrelevant and harmful. [↑](#footnote-ref-15)
16. Note that science-appliers can sometimes justify using overgeneralization in their recommendations on the ground that inviting noncompliance by those who would not benefit individually from following the recommendation will erode the compliance of those who would—if they take the former as models to emulate (esp. if they perceive that noncompliance offers only benefits, and no costs, to such persons), or may become confused about the recommendation—with unfavorable overall results. Does it follow that those who would not benefit have some ethical duty to comply nonetheless, on account of the bad example they would otherwise set? Or is a better solution to permit them to adopt the policy that is best for them, along with communicating effectively to the public a differentiated recommendation, along with the explanation behind it? [↑](#footnote-ref-16)
17. The outsiders need not be laypersons. They can be scientists from other fields whose expertise does not translate. [↑](#footnote-ref-17)
18. The material within will, in the general case, be spread across a spectrum of accessibility to the understanding of a given outsider: some will “be Greek to” him, some will be straightforwardly comprehensible, much will lie in between. (Even other scientists often cannot fully comprehend *all* of the material in their colleague’s research reports.) [↑](#footnote-ref-18)
19. Lesser force, but not none at all, as some of these issues, like theory-choice preferences, cannot be settled objectively by consensus or taking a vote of scientists. [↑](#footnote-ref-19)
20. Well, a similar complaint could be lodged against allowing or **encouraging youngsters to read books by themselves**, without a tutor standing by to ensure against misunderstandings that might even corrupt other regions of their belief systems, or granting freedom to **young children to make moment-to-moment choices for themselves**, instead of insisting upon their obedience to a hovering adult authority. [↑](#footnote-ref-20)