Can Strategic and Democratic Goals Coexist in Communicating Science? Nanotechnology as a Case Study in the Ethics of Science Communication and the Need for “Critical” Science Literacy

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Can Strategic and Democratic Goals Coexist in Communicating Science? Nanotechnology as a Case Study in the Ethics of Science Communication and the Need for “Critical” Science Literacy

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ABSTRACT: Science communication emerges from social contexts in which the value of popular support for science and technology (S&T) is presumed. This article does not dispute the assertion that S&T is “good” but does assume that people should make free and informed choices about it, explored here using nanotechnology. This problematizes the purpose of science communication and suggests the need to reconceptualize science literacy as having critical dimensions.

KEYWORDS: democratic practice, ethics, nanotechnology, public engagement, science communication, science literacy, strategic communication.

1. INTRODUCTION

Science communication is motivated by rather diverse goals. One set of these goals concerns the empowerment of “ordinary” (that is, other-than-expert) people to make wise choices regarding the adoption of particular forms of science and technology (S&T) into their everyday lives, either as consumers (through purchasing decisions) or as citizens (by influencing policy). By emphasizing empowerment rather than predetermination of choices, these goals are directed toward enhancing “bottom-up” decision-making capacity. The second set of science communication goals usually concerns the promotion of S&T more generally and is more “top-down” in nature. These goals commonly presuppose that S&T is generally of benefit to society, both economically and in other ways, such as through the capacity for improving people’s general health and welfare or by contributing to environmental sustainability. (More cynically, top-down forms of science communication can also serve the interests of society’s elites, including S&T industry interests.) Using nanotechnology as a case for study, this article explores the question of whether these two sets of goals are ethically compatible or incompatible, and under what circumstances; it also introduces the concept of “critical science literacy” in the hope of refocusing the “science literacy” debate.

Over the past several decades, discussions of science communication have moved from a “deficit model” in which “the problem” of science communication is defined in terms of knowledge deficits that need to be addressed to a “discourse” or “engagement” model in which it is widely recognized that citizens in democracies lack opportunities to talk through issues associated with science and otherwise involve themselves with developments in science and science policy. What sorts of outcomes these opportunities should produce is an open question, however. Reliance on new forms of science communication suggested by the “engagement”

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model does not necessarily resolve the problem of purpose. In 2010, British scholar and prominent proponent of the “public engagement” approach Brian Wynne resigned from the steering group of a significant UK Food Standards Agency effort to “engage” people in discussions of genetic modification of foods, reportedly describing the project as largely a propaganda effort on behalf of the biotechnology industry (Vidal, 2010). This illustrates that it is motivation, not just method, which should concern us.

Communicating about science and technology (S&T) with non-technical publics has many purposes, ranging from (on the one hand) providing information and education that help enable economic survival in a highly-developed economy and that empower citizens to participate in identifying wise management policy to (on the other hand) achieving persuasive goals designed to get people to accept (or, sometimes, to reject) particular forms of S&T. While some observers assume S&T is always “good,” and therefore science communication designed to enhance its acceptance by any means available is likewise always “good,” history is clearly replete with cases where this has not necessarily been the case. Scholars have documented innumerable such cases with respect to human rights, the most notorious of which are certainly the infamous Nazi war crimes; the history of human subjects research is littered with other cases where even well-intentioned researchers ignored important issues of human rights, and much investment in S&T has certainly gone to improving weaponry that can kill more and more people—even if done in the interests of “keeping the peace.” More subtly, S&T may influence social life in arguably less-than-ideal ways, as the Luddite movement claimed. And our present environmental challenges, up to and including global climate change processes, are often directly associated with S&T: we consume energy and produce carbon dioxide in a thousand daily ways that were not even imagined a century ago.

So, of course, while some observers always see good in S&T, others are always suspicious of it, not only for its (albeit largely unintended, the Nazi example notwithstanding) bad impacts on human beings and their social lives, but also because of its environmental consequences (also often largely unintended). All of this creates a complicated knot of diverse, often implicit, motivations and purposes associated with science communication that this article attempts to go some way toward untangling. In so doing, I try to begin with an essentially agnostic position as to whether S&T is—on average—more good than bad, especially in specific cases. However, I do confess here at the outset to a personal belief that the benefits of S&T, taken as a whole, generally outweigh both its costs and its risks, but I also confess to a conviction that S&T must be wisely and cautiously managed to operate in society’s best interests and a strong belief that the critics of S&T are not always and necessarily wrong, especially with regard to social and environmental consequences.

An integral part of the very definition of human existence (present in the concept of the “tool-using” human), S&T does have the broadest possible range of ethical implications. On the negative side, even where the question is not one of blatantly trampling on ordinary human rights or rampantly polluting the environment—the bad implications that most people can readily recognize—there are many other issues of what needs and interests different kinds of S&T serve (who benefits), who is most exposed to the risks associated with S&T (environmental and worker justice), and which S&T is most worthy of investment, given limited societal resources (which science should be privileged). These distributional issues are also ethical in nature—and nanotechnology is very clearly a prime example of all three of these distributional questions.
Along with its almost unarguable benefits, then, S&T routinely brings negative consequences that are unintended, not only environmental in nature but also regularly involving direct impacts on human health and changes in lifestyles that can be bad as well as good (for example, in the familiar case of automobile use); community and even societal sustainability (given global climate change); and other quality-of-life issues (including the depersonalization and fragmentation characteristic of modern life, which is difficult to neatly separate from our technological world). And there are other cases, such as embryonic stem cell research, that present ethical challenges primarily for particular segments of society (in that case, those holding particular religious beliefs). Achieving appropriate balance between the moral objections of one segment of society (whether a tiny minority or a clear majority) and the interests and beliefs of other segments—or of “society” or “humankind” as a whole—is certainly particularly challenging and controversial.

Learning about S&T, especially in formal settings where it can be documented by course completion, certificates, and degrees, enhances job prospects for millions around the globe; S&T boosts our personal health and welfare in hundreds if not thousands of ways; S&T economic sectors also provide new investment opportunities (and make money for colleges and universities, institutions that—in an ideal world—make invaluable contributions to the quality of life that go well beyond the direct impact of S&T on society, and yet represent a set of special interests even so). It is therefore worth stressing that the ethical issues and other issues of wise management of S&T do not solely concern avoidance of the negative or morally contentious aspects, but can also concern the fostering and distribution of its positive ones. Yet this can be contentious as well.

The current vaccination controversy is one particularly interesting example. Is it right for a majority belief (i.e., in vaccination’s benefits), even if correct, to dictate individual medical choices among a minority who reject that belief, or do people have a right to their objections, even if scientifically incorrect? What if the individual choices (as in vaccination) impinge on the rights of the majority (in this case, to be collectively less susceptible to certain diseases)? And is it possible in this case that if the minority were “properly” educated about the underlying science, they would embrace vaccination rather than reject it? On the other hand, is it even possible, at least hypothetically and in limited circumstances, that the minority could somehow turn out to be scientifically correct and the majority wrong? One doesn’t always have a crystal ball about how these things will evolve; controversy over the fluoridation of water, for example, continues to this day. Such is a quandary for science communication practice, in which it is often not possible to wait until the philosophers, the courts, and the science itself catch up to everyday decision making!

The science literacy “movement,” which can be traced back to at least the late 1950s (DeBoer, 1990), is a reflection of the observation that people are often called upon to embrace or reject personal behaviors, social policies, and political candidates on the basis of S&T considerations, from evaluation of energy or healthcare management alternatives to making conservation, environmental protection, and land use choices, to climate change mitigation, to the provision of support for basic research or for particular activities or programs such as agriculture or the space program, to adhering to a healthy diet and lifestyle. It seems reasonable to insist that wise choices often require some level of basic understanding of the S&T involved. These choices clearly impact the nature of local economies as well as both the quality of human life and the health of the environment. In democratic societies, citizen engagement in these decisions seems desirable, perhaps even essential. Individuals in contemporary societies
are regularly called upon to make lifestyle adjustments or buy products sold as improving their health or that of the environment, requiring them to be intelligent consumers of such claims—as well as voting citizens who have a hand (even if indirectly, through elections) in policy decisions.

The notion that “the problem” of “public understanding of science” consists of knowledge deficits—the so-called “deficit model” (Ziman, 1991) of science communication—assumes that the goal of public communication about science is to remedy observed information or knowledge deficiencies, with the implicit purpose of yielding better decisions (often expected to take the form of more support for science). This view privileges a utilitarian perspective on both science itself and science communication, with a positive outcome envisioned: the goal is to create a better world for all, through science (or, as General Electric’s famous tagline has it, “We bring good things to life”). However, there is only a weak relationship between levels of knowledge and people’s positions on S&T adoption (Sturgis & Allum, 2004). Having more information and knowledge may well improve S&T decision making, but it does not predict the direction of those decisions particularly well.

Despite this, many forms of science communication—those that are more persuasive, even propagandistic, in nature—are either salesmanship per se or at least seek particular outcomes strategically chosen with financial and other interests in mind. Corporate interests want consumers to purchase their S&T products, from cell phones to pharmaceuticals. Particular economic sectors want public support, both “moral” and financial, for their S&T endeavors. The non-profit world is hardly immune from these dynamics. Universities and research institutes, as well as individual scientists and engineers, want recognition and prestige, which is often assumed to make fundraising and successful grantsmanship easier. Environmental interests and other advocacy groups (e.g., professional organizations, consumer advocacy groups, health-promotion agencies, and so on) seek public support for their activities and for the policies they often exist to promote, and they likewise make use of strategic science communication to do so. Dorothy Nelkin called her well-known book Selling Science (1995) for good reason; even though her subject in this work was primarily journalistic treatment of science, rather than marketing efforts, the goal of “selling” pervades much of our communication about science in either sphere.

Sometimes these two sets of goals—democratic ones and strategic ones—seem to converge. Automobile companies developing and marketing fuel-efficient vehicles, for example, are marketing products they hope will generate profits, while at the same time they are (at least arguably) helping empower people to reduce their carbon emissions and thus mitigate climate change effects. This duality extends beyond the corporate world; advocacy groups of all kinds may seek positive change in our use of S&T, but they also need resources to continue their work. This convergence is often problematic, or can be more apparent than real: the term “greenwashing” captures the perception on the part of some observers that organizations (e.g., those in the corporate world, but also others) can and do expend effort to appear environmentally responsible when in fact they are not. And there are myriad other ways in which pursuing market advantages can have unintended consequences that are not always in the long-term collective interests of society, as numerous critics of our modern “consumerist” societies have pointed out.

All of this raises many practical ethical questions. Is it ever acceptable to use manipulative or propagandistic techniques to promote policies, activities, and products that support the public good? How can anyone decide when this is justified—which choices are in
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fact in society’s interests, and which are not? Where does hype end and socially progressive advocacy begin? Or are strategic communication approaches always at root manipulative and therefore always at odds with the ideals of democratic governance, which imagine a free actor freely making choices based on access to authentic, truthful information?

Nanotechnology, promoted as the “next great wave” of technological development, is a contemporary case in point. Many believed that nanotechnology would follow a rocky course more or less parallel to that of biotechnology, in terms of public acceptance. This undoubtedly encouraged unprecedented public investment in social science research about effective strategic communication, from which science communication scholars around the world have benefited. The investment has resulted in remarkably little direct confrontation with the ethical issues involved, however. Whether biotechnology, nanotechnology, or any other technology should be embraced uncritically may depend in part on whether one believes that the benefits consistently and reliably outweigh the harms. However, the ethical principles relevant to science communication may be relevant regardless of utilitarian concerns (i.e., regardless of whether the particular S&T in question is “good for us” or not) to the extent they tend to erode or foster individual decision-making autonomy, a freedom generally recognized as a hallmark of democratic governance.

Further, determining which S&T is “good” and which is “bad” inevitably involves the application of value-driven choice. Thus the question of what forms of science communication are “ethical” is to some extent inseparable from the question of whether, and when, it is acceptable to impose one set of values over another. Even posing this question seems *prima facie* inconsistent with democratic practice. And at a minimum, promotional communication that seems one-sided or insincere can simply turn people off and may backfire, just as some many anti-smoking and anti-drug campaigns have been observed to have backfired. Wary and wise members of today’s S&T-rich societies are understandably, perhaps even justifiably, cynical about many of these arguments, and messages that do not deal with risks as well as benefits may not be well-received.

Even if we could safely assume, strictly for the sake of argument, that in the long run S&T (including biotech and nanotech) can and will consistently bring important benefits by improving health and nutrition, reducing hunger, making life more enjoyable, and facilitating sustainability, that it only rarely involves important risks, that these risks can be managed successfully, and that people will believe our promotional messages and these will not turn them against us, there is the additional issue of whether some forms of persuasive, promotional communications serve to reduce autonomy by manipulating people’s decision making, even if “for their own good.” It may perhaps be less unethical to coerce and manipulate where the benefits to humanity are tangible and assured, but it is still ethically problematic.

While nanotechnology shows little tendency to follow in the footsteps (so to speak) of biotechnology, in terms of public response, that hardly means there are no ethics to consider — particularly considering that some forms of nanotech, some of the time, certainly appear to carry some tangible potential for harm to health and/or environment (see, e.g., Shatkin, 2008)—ironically, perhaps more tangibly than biotech was known to carry at a parallel stage in its introduction.

This article attempts to provide a foundational exploration for considering the question of what kind of ethical thinking should apply to science communication practice in the particular case of nanotechnology, the latest big new trend in S&T development and one widely predicted to transform society generally and the economy in particular. Whether or not
these predictions are excessively “hyped,” and whether or not the anticipation of bad effects turns out to be accurate, nanotech does provide a useful case for asking (and perhaps partially answering) the question of whether democratic and strategic goals for science communication can live in harmony or are necessarily incompatible. Of course, this inquiry takes place in a context in which the jury is still out on just exactly what the benefits and harms of nanotechnology might be—but then this is almost always the case when new S&T is being rolled out for public scrutiny.

2. BOTTOM-UP COMMUNICATION: ALWAYS DEMOCRATIC?

In our technology-driven societies, some choices about technology are heavily constrained. It is often difficult for an individual person or family to decide they want to utilize mass transportation more heavily, for example, or to use more alternative energy, or to walk rather than drive a car to complete everyday errands, unless the local infrastructure supports this—and in most cases, it does not. Yet, at the same time, there are other instances in which individuals are called upon to make choices regarding which science and technology (S&T) they should adopt, and which S&T they might want to reject—or at least which they might prefer to avoid embracing. Many, perhaps most, of these choices are implicit, expressed primarily as purchasing decisions or occasionally as voting decisions to the extent campaigns for particular candidates or proposals focus on S&T. Of course, as we all know, purchasing decisions, as well as voting decisions, can be made thoughtfully, or they can be made impulsively. Indeed, one goal of science communication might be thought of as encouraging thoughtful choices and discouraging impulsive ones.

People may make these decisions for a very broad range of reasons, of which cost (or risk) versus benefit ratios are only one example. Organic foods, for instance, may be purchased because they are believed to be superior (that is, to carry specific benefits to health), despite being more expensive. Or they may be purchased because of a wish to support a certain lifestyle and approach to food production among farmers that some consumers specifically associate (rightly or wrongly) with the production of organic foods and which they find worth supporting regardless of greater costs and even where other consumer benefits could be marginal. Further, utilitarian arguments like these are not the only ones that may be relevant. Underlying beliefs about the natural order—whether seen as an issue of environment and ecology or as something “God” (or “a god”) gave us—can also figure in. This is, of course, only one example among many.

Individuals make these decisions both as consumers and as citizens. As consumers, they determine which products to buy, albeit as already noted they are most commonly faced with a highly-constrained set of alternatives (see Schibeci, Harwood, & Dietrich, 2006 for a case-based discussion of institutional constraints on involvement as citizens). Free-market enthusiasts may imagine that consumer choices are all-powerful, but this is unrealistic. Even in the world of pharmaceuticals, consumers are presented only with those choices that the market provides—thus the phenomenon of “orphan drugs” for diseases that are not widely-enough distributed to support “big pharma” investment. And this is not to mention the pervasively propagandistic influence of advertising and marketing on the choices we actually make, or the more subtle influence of media representations more generally—including the consumerist values embedded in both news and entertainment, as well as advertising, that our children then internalize. Even so, consumer choices can be powerful, collectively; consumer boycotts
matter, and consumer popularity encourages further investment, whether in organic food production or in (say) “smarter” cell phone technology.

So, while consumer choice may be a relatively limited and constrained form of autonomy, it is a form of autonomy nevertheless, and it does have the potential to influence the decision making of larger entities and institutions such as corporations and government agencies. Yet as citizens, by contrast, individuals are conceptualized as in some sense acting more purposively on behalf of society and in the service of broader societal values— trying to make wise decisions about S&T on behalf of society, decisions that are more conscious, potentially more influential, and perhaps less constrained, or at least constrained in different ways, than the decisions they might make acting solely as individual consumers, concerned primarily about their own needs and gratifications and choosing from among products already available in the marketplace. People acting as consumers, in other words, often appear less autonomous, less powerful, less deliberate, and perhaps even less important than people acting as citizens.

Individuals acting as consumers commonly make (or decline to make) purchases of discrete items—in the case of nanotechnology, products such as clothing or sporting goods or even, in a commonly imagined future scenario, food products and medicines that may be nano-enhanced—as opposed to individuals acting as citizens who support (or oppose) policies about regulating the risks (of nano or of other S&T), policies that are adopted or rejected at the societal level. Individuals also act as consumers of specialized services such as medical care that may also be nano-enhanced (Priest, 2009), but again their choices of discrete elements (which medication to take, or not, which doctor to visit, or not, and so on) seem of a different character from their influence as citizens over larger-scale questions about how medicine is regulated or organized or how health care is funded or what research is supported, however limited that influence might be in a particular case and on the part of any individual person.

Citizen power, then, most readily comes to mind when larger-scale decisions are being made, e.g., whether to make policies that encourage the diffusion of alternative energy technology or further regulate existing energy technology such as coal burning or nuclear power generation. In such cases citizens often exercise their power primarily through others—donating money to groups that are pressuring politicians or other officials or voting for particular candidates that they see as furthering their goals. Presumably politicians, as well as bureaucrats, are responsive to citizen opinion as measured by opinion polls, although political scientists have sometimes argued that this responsiveness is not as strong as an observer might imagine. Citizens can also work to form new organizations to lobby political bodies (e.g., members of legislatures or other governing bodies) on behalf of issues they believe are important. Employees, acting as citizens, form unions or professional or trade groups—which in turn may work on behalf of workplace health and safety through negotiating with corporations and lobbying government officials, as well as politicians and political bodies, to improve working conditions, including issues involving health and safety that may be associated with nanotechnology in the workplace or nano’s environmental effects. In some cases and in some societies, they also vote on science policy issues directly through various forms of referenda.

Generally, then, individuals acting as consumers are conceptualized as being relatively less autonomous (more constrained) than individuals acting as citizens, but in either case they are conceived of as making individual-level decisions that, taken as a collective whole, ultimately (in the aggregate) influence society’s choices with respect to the diffusion of
technology. Both citizens and consumers have at least limited autonomy and some power to
direct or constrain (in turn) society’s adoption of new technology, and yet in both cases the
power does not appear absolute: whether people are acting as consumers or citizens,
completely upsetting the status quo through collective action is an unlikely outcome (although
this does happen, whether through violent revolution or successful but largely peaceful social
movements). The current public engagement movement for S&T seeks to encourage this kind
of (peaceful) citizen involvement and the creation of new forums for public consultation such
as consensus conferences, thus supporting by improvement rather than directly challenging the
existing structure. Rather than completely upset the apple cart, then, the public engagement
movement seeks to better balance the information equation by enhancing the effectiveness of
bottom-up communication.

In the normal course of events, of course, citizens are heavily constrained by the
political system that surrounds them and the need to make a living (e.g., if mass transportation
is not available to them, they will likely continue to support the construction of the new
highways needed for them to get to work in a reasonable time), and can only rather indirectly
and long-term (if at all) influence the availability of true technological alternatives, let alone
the priorities of scientific research (although the contemporary emphasis on medical research,
at least in the US, probably represents an indirect reflection of what most concerns most of the
population, in terms of scientific progress). Realistically, citizens cannot generally and
unilaterally control the policy choices that are available to them, but can only choose across a
limited range of choices, just like consumers choosing from among a limited range of kinds of
canned soup. Nevertheless, citizens do have power; like the power of consumers, it is at its
peak when it involves organized collective action, something the public engagement movement
argument attempts to foster, albeit within limits and under controlled circumstances unlikely to
erupt into violence.¹

Collective action is conceptualized here, for the sake of simplicity, as an aggregate of
individual decisions, but power is enhanced by acting together, and collective power is not
simply the additive total of individual power. People situate their own opinions, and express
them or not, with respect to an environment in which they are constantly projecting what other
people think—and might think of them (Noelle-Neumann, 1993; Wyatt, Kim, & Katz, 2000).
They respond to the perceived “climate” of collective opinion, mentally positioning their own
views in response. And motivated individuals within society often actively attempt to enlist
others to their points of view, which also contributes to opinion and action processes that
transcend individual-level phenomena. Collective action is not always simply the sum of a
series of individual actions (or non-actions), in other words.²

Even so, despite the over-simplification involved, both consumers and citizens (that is,
individuals acting as either consumers or citizens) can be thought of as making largely
independent individual decisions that add up to a societal preference, whether expressed by
buying or (say) by behaving or by voting. Both citizens and consumers make use of

¹ Of course, one could argue that the public engagement movement provides just the sort of “steam escape
valve” that keeps society from further collapsing, or exploding, and in this way supports the status quo rather
than facilitating deeper change. I do not really dispute this argument, but to pursue it here would take the
reader too far afield. I would personally still rather have more public engagement than less.

² This constitutes an important limitation of the “psychometric” paradigm for risk perception, in which the role
of values and preferences in individual-level decision making is relatively well understood, but the role of
collective processes tends to be ignored.
information available to them in making those decisions. We usually think of science communication as providing these individuals with the information that they need to do so, and thus facilitating their independence and autonomy in either role. Yet truly disinterested information, suffice it to say, can be hard to come by.

3. TOP-DOWN COMMUNICATION: ALWAYS PROPAGANDA?

While “bottom-up” empowerment is a goal consistent with an idealized view of a pluralistic, democratic society in which individuals acting as consumers but especially as citizens drive (or at least influence) societal decision making, much of the information that is supposed to empower these individuals comes from a “top-down” direction—that is, much of it is generated and disseminated by (at least relatively) powerful, elite institutions within society. This means government agencies, corporate and industrial entities, political parties, influential advocacy groups (here even including unions and other workers’ groups, to the extent these have power and resources), and in the special case of S&T, universities, professional groups, and research institutes as well. This is, of course, also the nature of pluralistic democracies in the controversial version sometimes described as “elite pluralism” and generally attributed to the work of V. O. Key (1961) in which democracy is seen as coexisting with concentrated institutional power. However, unlike the presentation in most basic civics texts, this essay seeks to unpack a little more thoroughly the role of information and communication in all of this.

Even if some—or, for the sake of argument, let’s even say many—of these powerful institutional agents and their members and employees have the interests of the broader society at heart, institutional communication tends to serve the interests of the institutions that produce it (Gandy, 1982). And institutional control over information is particularly acute in cases where the subject is specialized and technical, as in nanotechnology. This might not be an inherently disempowering dynamic, vis-à-vis non-expert publics, but it certainly presents challenges for truly democratic (that is, bottom-up) decision making: the information that is supposed to empower autonomous citizens of a democracy to make good choices is not, by and large, disinterested information. Therein lies the nut of the problem, so caveat emptor. And this is a special problem for S&T because arriving at the scientific “truth” is such a complex and messy process all on its own, and because scientific information is often inaccessible to most citizens (i.e., it can be incomprehensible and indigestible in its original form, as well as hard to come by).

Generally speaking, “top-down” communication efforts, those planned by a particular organization or group with some degree of resources and political or social influence (e.g., the government or a major corporation or advocacy group), are strategic communication efforts to varying degrees, undertaken for a specific, conscious, persuasive purpose. Communication that is authentically intended to encourage unconstrained, bottom-up decision making is not the type of communication that we ordinarily refer to as either “top-down” or strategic in nature. However, this distinction is rarely as clear in practice. The actors involved in creating messages and disseminating information about S&T—the science communication professionals, that is—are usually either journalists, public relations or advertising professionals, or “public information” specialists. If journalists, they may be assumed to be autonomous to a degree, but they actually get much of their information from sources representing elite institutions and they are in practice constrained in a myriad of other very
important ways (Shoemaker & Reese, 1995). For example, many of the most influential of these journalists work for large media corporations with their own financial bottom lines to worry about and having many interests in common with those of other large corporations, a point critical media scholars have been making for many years.

Further, the journalists are outnumbered by the public relations and advertising folk, especially in today’s world where the news business is being dramatically “restructured” and science-savvy journalism appears at risk of becoming a scarce luxury. New media produce a lot of seemingly new messages, but the vast majority of them are repackaged from information disseminated by the same old players. As professionals, public relations and advertising specialists are governed by their own codes of ethics, of course, just as journalists are (although compliance is naturally not perfect in either case). The distinction seems clear; the messages they create are sent out on behalf of particular interests—those of whoever is paying for the work—whereas journalism is supposed to be carried out on behalf of society. Again, caveat emptor, but at least advertising messages are generally recognized as such, whereas public relations and journalism have a generally symbiotic relationship that makes many observers uneasy. It seems an inherent conflict for journalists to be dependent on public relations people for story ideas and information, but they are—and all the more so in cases of specialized topics such as S&T or medicine, including nanotechnology.

This leaves public information professionals as the only potentially disinterested disseminators of S&T information. Perhaps theirs is indeed a “softer” bias, more benign from society’s point of view. Most public information specialists tend to work outside of the for-profit corporate world. However, they also represent special interests; they work for government agencies, universities, or professional associations, none of which are actually disinterested at all. This became all too obvious in the case of government when the dissemination by the US Office of National Drug Control Policy of video press releases opposing illegal drug use, releases prepared by an outside public relations firm, were ruled illegal by the General Accounting Office and helped prompt a Congressional Research Service report that attempted to clarify the fine line between “information” and “propaganda” (Kosar, 2005).

4. THE DILEMMA FOR SCIENCE COMMUNICATION

Clearly, if S&T always brought only unmitigated good, and if people were always wise, then providing people with increased communication, information, and education about S&T, both in general and specific to cases of newly emerging technology such as biotechnology and nanotechnology, would result in people’s making “wise” (that is, from this viewpoint, pro-S&T) decisions—whether this information is provided merely strategically or with the active intent to empower. No science communication “problem” would exist except to determine what the best, most effective means of dissemination is. Under these circumstances, there is little need to clearly distinguish between empowering and strategic messages; wise people who are “properly” informed will sort it out and make the choices we expect—that is, they will opt for whatever S&T we are offering. Of course, S&T is not always an unmitigated good, and people are not always wise, so this is a very Pollyannish position.

Even if S&T in the abstract were always good and “ordinary” people were always wise, specific developments in S&T clearly can be more compatible with some values than with others, and different specific developments may vary in terms of how compatible they are with
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particular value systems (or, at a minimum, how compatible they appear to be with particular value systems). Since, in pluralistic democracies, values vary—something we strive to appreciate, along with autonomous decision making—we have every reason to be wary of top-down strategic communication (about S&T or about anything else), even if engaged in for people’s “own good.”

Does morality, then, depend on motivation here? It is not irrelevant. It is one thing to empower people to make informed choices about whether to be vaccinated, for example. It is quite another to—in effect—force them, or perhaps we should say coerce them, by the effective use of persuasive or propagandistic communication, to be vaccinated. I am quite willing to assume here that the underlying S&T about the positive effects of vaccination and the low levels of risk involved is entirely correct. Rather, the issue is one of undermining individual autonomy and whether our commitment, as citizens of a value-pluralistic democracy, to preserving individual decision-making autonomy overrides our commitment, as (say) public health workers, government officials, or doctors, to preserve their health through top-down means. And this may be a “slippery slope” situation, i.e., a situation in which making an exception for preserving health (after all, this appears to be a near-universal value) would facilitate us making other future exceptions that might be much more problematic.

Would it be all right if we could escape this quandary by slipping in and vaccinating people (and their children) while they slept, without their knowledge and consent? Medical ethics says not, under the doctrine of “informed” consent. Ideally, what one hopes for is that people will understand the science well enough to freely give consent to whatever is in their own, albeit value-laden, interests. But in the back of our minds, it is very tempting to assume that if only they understood the science, they would make the same decision that we would make in their shoes. As human beings and members of a particular culture, it is very difficult for us to fully grasp that other human beings, members of slightly different cultures, in possession of all the same facts, would make different decisions. This is all just another form of the deficit model, in reality. But let’s also be honest with ourselves: the significant investment being made in nanotechnology education through science centers, experiments in public consultation about nano, and the intensive study of public opinion about nano would not be considered successful, in science policy circles, if the populace were ultimately to decide that nano is too risky, too unnatural, or simply too expensive to tolerate.

At the same time, education of “ordinary” people to make wise decisions as either consumers or citizens presumably seeks to increase autonomy, rather than engineering a particular opinion outcome. Science communication should ideally maximize the information individuals are able to bring to bear on these decisions. This largely “bottom-up” purpose necessarily presupposes that people might, under some circumstances, wisely opt against something in S&T that they are being offered—whether they perceive it as being too expensive or too risky, in proportion to benefits, or as violating their ethical principles or threatening their values. Education and information help “arm” people against making poor decisions driven by such factors as unfounded fears, failure to understand benefits, poor understanding of probabilities (as applied to, say, risks), or blind trust (or distrust) in a certain type of spokesperson. An underlying assumption of the move toward enhancing deliberative democracy for S&T choices is that people are indeed capable of making good decisions, given appropriate information and education, as was famously argued by John Dewey (1927). This does not mean only favorable opinions, however, else the entire exercise loses much of its meaning.
Yet attempts to provide information and education to consumers and citizens in the hopes they will make better “bottom-up” decisions can be and often are undertaken for the purpose of encouraging a particular kind of decision, or even a specific, particular decision—some sort of predetermined conclusion—up to and including accepting or rejecting some form of science, or a particular technology, that the communicator (or their employer) believes should be evaluated exactly so. Like consumer choices, this can happen without much thought, involving the unexamined assumption that more information and education will lead to a more pro-science attitude. Indeed, many in the science, science policy, and science communication communities assume that this is the case, and sometimes it may actually be true. This is not always true, however, and the unwarranted assumption that it is always and necessarily true that information and communication about science will result in more support for science is exactly the assumption underlying the by-now-familiar “deficit model” of science communication mentioned above, which the community of science communication and science studies scholars has roundly rejected (in favor of the “engagement” model, in which many of the same problems certainly appear to be embedded).

Other “top-down” communication efforts are guided by a more explicit specific purpose. Advertisers seek to have products adopted. Both doctors and health communicators typically seek to have healthy choices adopted (one hopes so, anyway). And scientists, research institutions, universities, major journals, scientific societies, and government agencies usually release scientific information with more specific intent than simply educating the public; they seek to “sell” themselves as institutions, science itself as an enterprise, and what they may genuinely believe is the best science policy. This is, to be sure, a continuum; the distinction between “top-down” strategic communication and “bottom-up” informational efforts, while analytically useful, is not always black and white in practice.

As individual consumers and citizens, sometimes we cannot be sure how to evaluate the available information: We aren’t sure whether we are the victims of corporate “greenwashing,” for example, or whether a politician is sincere (and not misguided) when he or she promises to fix our economy, or whether a product or service that we are attracted to and that some entity is promoting to us will turn out to have a high risk of harmful unforeseen consequences, perhaps even a known likelihood that is being ignored, if not actively covered up. And, of course, organizations trying to sell the idea that we should reject certain kinds of S&T, or S&T more generally, can also be misleading us (and even themselves) as to the consequences. This kind of reflexive consumer and citizen awareness is a crucial component of science literacy, what I would like to call “critical” science literacy. How do we distinguish transparent truth from propaganda efforts, especially in technical areas characterized by great uncertainty, emerging evidence, and communication almost universally motivated by institutional self-interest? An awareness of this challenge—a critical awareness of the potentially propagandistic character of much, possibly all, science communication—is itself an important facet of (critical) science literacy.

Journalism students have often been taught that the reason all sides of a controversy deserve representation is to create an open “marketplace of ideas” in which intelligent information consumers will make wise choices to separate truth from lies. For some critics, this was never sufficient assurance that democracy would work. Traditional newspaper journalism was always driven by source interests and business considerations, as well as by professional ethics and standards; news has been sold just like other products. Today’s “newest” journalism—that is, journalism in the new media world—is if anything even more blatantly
commercial in its orientation. At the same time, good journalism continues, and good science journalism is still available—perhaps even more available than in the “old media” world, at least to those who actively seek it out. The problem is not now solely one of information sufficiency or availability, if it ever was; it is more one of information overload and discernment, again requiring a more critical science literacy than ever before.

Scholars and strategists who suggest we can resolve “the problem” of science communication by appropriately “framing” science or by developing the “magic bullet” message that will persuade the masses that the science behind climate change, vaccination, evolution, biotechnology, nanotechnology, and so on is sound seem to have given up on the “marketplace” altogether. But theirs is a “top-down” solution to a “bottom-up” problem, and one that could only be counted on to work well if their message were the only one available. Yes, it is a good thing to remind people that science is relevant to their everyday lives (to rely, that is, on messages and frames that resonate with people’s values). But one can only take this so far: it is neither desirable nor possible, and probably would not be effective, to restrict the flow of information to a particular set of views, whether about a controversy involving science or anything else. In an open society, even the most cleverly crafted pro-science message will have to compete with other ideas. This limits the potential influence of “framing.”

Unless we abandon the notion of democratic resolution of differences altogether, at least for scientific and technical issues, and embrace instead Walter Lippmann’s (1922) idea that citizens are neither interested in policy nor capable of considering it intelligently, information restriction is not desirable. Unless we retreat to a sort of information totalitarianism in which only persuasive messages representing one side of things are available, information restriction is not possible—and the great democratic potential of new media, once widely touted but now seemingly lost in the stunning realization that traditional journalism is disappearing, lies in the idea that everyone now has a voice. A “marketplace of ideas” may be necessary for democracy, even if not sufficient to protect it. And we have known since Carl Hovland’s World War II experimental research program on propaganda (see Hovland, Lumsdaine, & Sheffield, 1949) that one-sided messages are not very believable in most circumstances anyway.

Is there ever an exception—a situation where encouraging critical examination of claims about science might have disastrous effects for society? Indeed, this may have been partly what motivated the debates characterized as the “science wars”: If scholars dare to encourage critical reflection about the social character of science, are we risking another Dark Age when science was rejected, even forgotten? Not only the vaccination controversy, but other controversies—most notably that surrounding climate change—remind us of this dimension of our dilemma, the possibility that ignorance might yet snuff out what Carl Sagan (1996) called our “candle in the dark” (1). In short, it might kill us—all of us. It would take a crystal ball to figure this out, but on balance, it seems that the path forward is reasonably well-lit, and that retreat back along this path (the road toward information restriction, in other words) is not the best choice.

5. CONCLUSION

This essay is particularly concerned with nanotechnology as a case in point. In fact it’s a relatively easy case. Popular objections to nano are still muted. New experiments in public consultation, joint inquiry by humanists and scientists, and extensive and intensive public
education efforts probably should not take credit for this fact; nanotechnology does not seem to have the intensity of cultural resonance that came with bio (Priest, 2011). It also seems likely that a good many of the public engagement activities we’ve promoted have an element of “preaching to the converted”: absent active controversy, the most engaged, both among scientists and among “ordinary” people, are undoubtedly those already enthusiastic about the underlying S&T itself—an actively curious but supportive public. Nevertheless, the current “great experiment” surrounding nanotechnology and the public has certainly helped us to refine our toolkit of best practices for encouraging public consideration of new developments in science.

Yet one has to wonder whether we are tackling the most difficult dimensions of nanotechnology, even if it’s an easy case. By considering narrowly either the S&T itself, or scenarios that imagine a distant future, to what extent are we “whitewashing” nanotechnology’s tangible present issues—its environmental ramifications, worker and consumer health risks, or the social distribution of benefits from public investment? The toolkit we have been building may be too heavy on strategies for fostering public enthusiasm and too light on strategies for encouraging critical awareness. If critical science literacy is what we really need, how do we build this? Our “next generation” toolkit needs to tackle this goal. Getting people to consider the benefits and risks of nanotechnology may be just a “dry run” for getting people to come to grips with the benefits and risks of tomorrow’s S&T more generally—or the collective influence of the S&T industries that while daily saving our lives may also be destroying our environment.

REFERENCES


CAN STRATEGIC AND DEMOCRATIC GOALS COEXIST IN COMMUNICATING SCIENCE?


