2006

Science and Intractable Conflict

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Disagreement over the "science" is rarely the cause of intractable conflict. In fact, if the "science" or the "facts" of the case are at the core of the conflict, it is more likely to be resolvable. That said, scientific uncertainty, complexity and disagreement can nonetheless prolong conflict, exacerbate poor relationships and provide a rationale for avoiding resolution. This essay describes the role of science and other information in intractable conflicts and suggests how intractability may be alleviated through the strategic handling of information.

Burgess and Burgess (2003) describe intractable conflicts as "conflicts that stubbornly seem to elude resolution, even when the best available techniques are applied." They go on to point out that conflicts best ought to be considered as sitting on a continuum ranging from tractable to intractable. Examples of intractable issues include nuclear waste disposal, abortion, and intelligent design. Religious and racial conflicts are examples of issues at the far end of the spectrum. Decisions may be made on intractable issues, but their implementation may be frustrated and delayed, or the decision itself may be challenged repeatedly in various other political venues. In the case of abortion, for example, although Roe v. Wade ensures some rights at the federal level, anti-abortionists continue to challenge this policy in state legislatures and in the streets.

Although science may be looked to for answers in such controversies, such expectations are misplaced. Despite the strict prescriptions regarding the accumulation of scientific knowledge, widely known as the "scientific method," and the rigorous scrutiny of scientific work known as "peer review," scientific knowledge especially at the frontiers of knowledge where many intractable controversies are situated, is usually partial, tentative, and rarely definitive enough to change minds.

More often in intractable conflict, science eludes a consensus. Parties may even disagree on what constitutes valid knowledge.

Perhaps most importantly, core disagreements in intractable conflict are not factual, but ideological or political. In order to reach an agreement, parties need to agree on much more than what the facts are, or how they ought to be interpreted. Parties must agree on what to do next. Complex, science-intensive conflicts require accord on the "facts" as well as on the social goals.

Despite the widely accepted constraints of science and its social construction in academic circles (Andrews, 2002; Fischer, 2000; Kuhn, 1962; Schraeder-Freschette, 1993), and its shared not central role in intractable conflicts, antagonists often insist on wielding science as a shield, a weapon, or a tool of persuasion (Ozawa, 1996). When such strategic maneuverings are allowed, conflicts rapidly deteriorate into intractability.

The controversy over the handling of nuclear waste illustrates well how science is used in hard-to-resolve conflicts.

An Intractable Conflict

In 1978, the United States Department of Energy proposed a permanent repository for nuclear wastes at a site about 90 miles northwest of Las Vegas, Nevada known as Yucca Mountain. After nearly a quarter century of vigorous public debate, the site was finally approved by President George W. Bush in 2002. Construction began and the facility is expected to begin receiving wastes in 2012. However, as of early 2006, opponents, which include the state of Nevada and national environmental groups such as the Sierra Club, have not given up the battle and have vowed to take the case all the way up to the Supreme Court, if necessary. At the heart of the opposition are concerns about safety at the proposed repository site.

Secretary of the Department of Energy, Spencer Abraham, recommended approval of the Yucca Mountain site to President Bush by stating that first and foremost of importance to him in making this recommendation was the "sound science" that supports the location of this facility. By referencing the science, Abraham is signaling to the president a shield to deflect public criticism.

This "sound science" is exactly the science that the state of Nevada and 70 percent of its residents (according to two polls conducted in 1998 and 2004) believe shows that Yucca Mountain is not safe for storing the planned 77,000 tons of highly radioactive wastes. Opponents refer to studies by both federal government and independent scientists that suggest the site is not capable of preventing the radiation from leaking, with lethal consequences for the environment.

The "science" is being used both as a shield and as a weapon. Whether the Yucca Mountain site can securely contain wastes for the next 10,000 years in fact is impossible to ascertain. In general terms, the scientific analysis of the site and future conditions embody statistical uncertainties and methodological uncertainties, such as decisions about the appropriateness of simplifications of phenomena, the reliability of sampling, and the acceptability of data interpolation. More specifically, antagonists claim that predicting geological conditions into the future is hubris; geology describes and explains past events, not ones yet to occur. Whether Yucca Mountain's geology will maintain its current integrity or change in response to hydrological occurrences 10,000 or even 100 years into the future cannot be determined with certainty today. Therefore, whether this site is a safe site or not for storing highly radioactive wastes, cannot be established by science.

Although safety of the proposed repository is one of the focal points of the current controversy, it is more likely a surrogate for other, more philosophical and moral concerns, such as whether one state ought to bear the risks for the many others who reaped the benefits of nuclear electricity generation, or whether ensuring waste disposal will encourage continued or increasing reliance on nuclear power.

Contenders in intractable conflict exploit scientific uncertainty (and complexity) to generate support for their own positions or attack opposing ones, despite the fact that no amount of "sound science" will resolve the differences between them. Science is used as a tactical tool for garnering public support and influencing decision makers.

In another example, the 2001 Bush Administration's attempt to reverse more stringent standards for arsenic in drinking water evoked classic comments. Albuquerque major Jim Baca was quoted in *The New York Times* as saying, "What we would like is some definitive scientific evidence that this would be worth doing." In contrast, Representative Tom Udall astutely lamented, "There's been this refrain, whenever people don't want tighter environmental standards, they say there is no sound science" (Egan, 2001).

Other Factors Related to Science That Escalate Conflict

Science, or knowledge gained through execution of the scientific method and peer reviewed to ensure rigor, is not universally accepted as the only way, or even the best way, of knowing about the world. Beyond the methodological limits noted above, a reductionist approach is counter to a holistic and interconnected understanding. Increasingly, the need to integrate knowledge from diverse scientific disciplines is recognized as necessary and desirable among scientists and non-scientists alike.

Moreover, at a societal level, lay observations, experience, and commonsense knowledge that are gained through day-to-day interactions with a place over years may be as valuable as knowledge gained through formal science. Often serving as the basis for the perceptions and perspectives of non-scientists, failure to reconcile "local knowledge" with formal science may prolong debates, damage relationships and lead to intractable conflict and human tragedies. The struggle of residents in Woburn, MA to convince regulators of the deadly effects of decades of toxic dumping that contaminated the town's wells (Haar, 1995) and the lengthy battle by Lois Gibbs and her neighbors to win recognition of the deathly conditions at Love Canal (Layzer, 2006) are well-publicized examples of a lay population's efforts to gain legitimacy within legal and administrative structures that privilege formal scientific methods and those with appropriate credentials over commonsense methods of data collection and analysis. Fatal exposures may have been prevented and remedial actions instituted earlier had government regulators accepted more readily the residents' intuition and observations about their environments.

Finally, mishandling science can fuel mistrust that can aggravate relationships and prolong conflict. Adding oil to an already heated debate over Yucca Mountain, United States Geological Society (USGS) hydrologists admitted that they had fabricated facts in developing an infiltration model on which DOE decisions to move facility construction forward had been based. When evidence of this malfeasance surfaced, the Department of

Energy moved quickly to reevaluate the analysis. Not surprisingly, but also not convincingly, DOE announced that the original conclusions were sound (Werner, 2006). The damage was costly in terms of erosion of reputation and public trust, and the battle to shut down Yucca Mountain before it opens continues (Pegg, 2006).

Using Science Wisely

Addressing the use of information in conflict is important because failure to do so can pave the way for adversarial uses of science. Discounting sources of knowledge can be interpreted as disrespect and demeaning, and can erode trust. Poor relationships can push conflict down the spectrum toward intractability.

Given the limitations of what we can know at any given time, especially in high stakes issues that project into the unpredictable future, can science and other forms of knowledge be integrated artfully into discussions to facilitate agreement, to move conflicts down the scale away from "intractable" and towards "tractable"?

Over the years, we have learned a few things about what works best and when. Anticipating the strategic uses of science noted above (as a weapon, a shield, or simply a delay tactic), the sooner procedures are put in place to create a joint understanding of the "facts" of a case, the less likely such details will contribute to embittered relationships or push the conflict toward intractability. Early prevention avoids the development of suspicion and distrust.

First, participants involved in conflict surround complex issues should be urged to focus on the facts that matter. In our information-rich times, participants can be overwhelmed easily by data and studies that relate tangentially to the many issues at hand. What sorts of information are most relevant to the participants in the shaping of their understanding of current conditions, likely future conditions, and their preferred course of action? What sorts of information are most relevant to what participants care most about? In other words, what questions must be answered in order for participants to comfortably begin discussions about what to do next? By narrowing discussions to the information that participants care about, the facts that matter can be assembled, sorted and comprehended more easily.

Second, how can participants best understand the facts that matter? Can we value both the work of scientists and their elaborate computer models *and* the knowledge gained by residents living in a place over generations? Do hydrological models provide the best information about whether urban streams will flood into residents' yards and homes? Or do site-specific individual recordings of historical precedents (such as the water line on Grandpa's barn post) offer a more accurate guide? Can we put these facts together as complementary information rather than contradictory or competing? In fact, due to land use changes that have occurred since the big flood of Grandpa's generation, hydrological conditions may have changed dramatically and the barn post data may no longer be relevant. On the other hand, such data may augment formal data bases which are often limited to sampling and vulnerable to the methodological uncertainty mentioned earlier. Recognition of the usefulness and limits of all sources of knowledge as part of a joint effort to assess conditions is not only an important step toward defusing the incendiary potential of contradictory understandings. It is also an opportunity for demonstrating mutual respect for participants with different sources and sorts of knowledge.

Finally, participants should collectively and publicly acknowledge the persistence of scientific uncertainty. The mythical quest for "definitive scientific evidence" allows parties to avoid committing to action. When parties together recognize the limits of certainty, scientific and otherwise, they can then set about placing boundaries around the uncertainty and creating a range of probable futures. A good example of this occurred in an early Environmental Protection Regulatory regulatory negotiation. Clean air advocates and the wood stoves industry did not agree on the appropriate wood stove emission levels that would result in acceptable air quality. They did concur, however, on a reasonable range of likely figures and in order to reach an agreement decided to stagger implementation of more rigorous standards over time. By doing so, the industry was willing to accept lower emission levels in the longer term in exchange for more lax standards, or higher levels, initially. In actuality, the industry did not contest that lower emission levels would result in higher air quality. However, the need to prevent approval of more stringent standards until their production line could be re-tooled would have provided an incentive for the industry to exploit the uncertainty in prediction methodologies (Ozawa, 1991). By acknowledging and working with the range of uncertainty in the predictive model, the participants were able to reach an agreement rather than continue to disagree and delay any action.

Practitioners and scholars have examined carefully how information can best be integrated into decision maker to facilitate agreement and have developed advice for handling information in controversial cases based on both theory and practice (Adler et al, 2001; Ozawa, 2005). The application of this advice is dependent on the context and conditions pertaining to specific conflicts. As noted early on in this article, whether a conflict is intractable or not depends largely on non-scientific or non-factual matters. Nonetheless, the following points can help avoid science-intensive conflicts from moving down the continuum to intractability.

- Parties to a conflict should commit to regular dissemination of information in highly accessible formats.
- Workshops, panels, and other opportunities to disclose and explain discretionary elements of research, data and analysis should be scheduled regularly, as needed.
- Technical expertise should be made available to all parties.
- Participants and decision makers involved should publicly acknowledge the incomplete state of knowledge and their openness to receiving information that is "surprising," or that does not conform to their prior conceptions.
- When differences arise between or among different expert advisors, a public airing should be held to clarify the basis for the discrepancies.
- Participants should look for ways to create opportunities for short-term decisions that can be reviewed at a later date, for example, after additional information becomes available.
- Ongoing monitoring and data collection according to agreed upon protocols should be put in place to develop confidence in agreed upon actions and to allow for adjustments if necessary.

Sharing information and knowledge, scientific and of other sorts, should be conducted early and often in forms accessible and ingestible by all. Generally, this approach is called "joint fact-finding," but the points above delineate specific objectives and procedures. When the "science" or basic "facts about the case" become the focal point of a dispute, a mediator must work to disengage parties from their espoused positions. Underscoring the partial and tentative nature of science, and the inherent uncertainties of predictive sciences in a public manner is one way to do this.

Burgess and Burgess (2003) remind us that intractability is caused by "irreconcilable moral differences, high-stakes distribution issues and domination or "pecking order" conflicts." Because one's perception of reality may affects one's moral stance and sense of what is possible in terms of distribution of benefits or harms, science, or "what the facts" are, undeniably comes into play. However, the role of science is more of a "supporting prop" rather a leading actor.

The case of global warming and greenhouse gases is perhaps a leading contemporary example of the extent to which "the science" can help frustrate efforts to reach agreement on complex, seemingly intractable conflict. Despite more than a decade of a growing consensus among the world's leading climatologists and meteorologists, the Bush White House continues to be uninterested in taking action to reduce carbon emissions to temper rising global temperatures. Apparently, no amount of scientific evidence will persuade the Administration to sign the Kyoto Protocol. The battle is ideological and political, about distributional gains and losses and philosophical and moral compulsions. The decision to sign an international agreement to curtail global disaster is not centered on science. As is unfortunately all too often the case, it is unlikely that the best conflict resolution techniques will shift this intractable conflict.

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