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MOVING FROM "NO" TO "MAYBE"

A Review of Some of the Intellectual Foundations Underpinning the Use of "Joint Fact-Finding"

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I. Overview

Policymakers and advocates frequently complain about our inability to productively address science policy debates proactively. In this paper, we will demonstrate how cognitive, decision making, and judgment biases create difficulties for issues like climate change planning, GMO labeling, the teaching of evolution, or the debates over vaccine policies. Sometimes, different interests and values or bad relationships drive these controversies. However, in the natural resource, public health, energy and environmental arenas, differences often center on contested scientific information and relevant knowledge. Understanding what impels these challenges helps us design better processes to deal with them. With better insight, we can shape new processes-- such as Joint Fact-Finding, citizen juries, and 21st century town meetings--to arrive at decisions that are more informed and politically, socially, and economically tractable.

These new processes synthesize and incorporate complicated scientific, technical, and local information into public engagement and consensus building. Many organizations, municipalities, state, and federal agencies have realized that they cannot develop public policies and plans without public engagement. However, traditional public hearings and public meetings do not integrate science and technical information with public values and preferences. This rift is particularly significant in addressing controversial environmental, public health and natural resource planning and policymaking decisions.

Information by itself is insufficient. Good plans and policies include both scientific and technical information and citizen values. However, without paying attention to "facts" as part of the dispute, public engagement processes discount the importance of reliable information and valid evidence in making public policies and plans. Collaborative leaders are crafting new approaches like Joint Fact Finding that address values, as well as thinking, judgment, and decision-making bias to integrate the best information into public decisions. This brief paper summarizes what we know about those complex challenges.

II. People Problems

In 1998, Dr. Andrew Wakefield published an article linking the MMR vaccine with autism.[ii] Parents began spacing their children's' vaccines and skipping the MMR vaccine. The American Food and Drug Administration removed the preservative thimerosol from the vaccine in 1999,

even though it found no empirical research connecting the vaccine to neurological disorders. [iii] By July 2014, many public agencies concluded that there is no empirical research connecting the MMR vaccine or its timing to autism[iv]. However, parents continue to worry about vaccinations and some delay or skip their children's vaccinations. Are parents irrational because they continue to worry about vaccines and their children's health? Are they stupid? Should we blame the public health system's communication mechanisms? When controversial knowledge claims influence public debates, people often do not recognize their cognitive and decision-making biases. Information processing under duress affects one's ability to understand what is going on.

Cognitive Bias

Although we have an amazing ability to process information, given the vast amount of information and decisions, we all take short cuts. We use short cuts--information processing shortcuts--to cope with complexity[v]. Cognitive psychologists have been studying these biases, and the empirical literature is rich with lists of heuristic biases and criticisms of the approach. The research points to several informal reasoning strategies we use to classify, organize, and interpret information.

In the vaccine example, several cognitive biases affect how people process all the information about vaccine safety. First, we tend give extra value to specific events, facts, or pieces of information. Early information is our anchor; even if we modify that information later, we do not change very far from the original information. The original information "anchors" us.[vi] The vaccine example shows how confirmation biases limit the availability of new information to change minds. Our tendency is to seek and remember information that confirms our preconceptions. Worried parents do not "hear" new information from the CDC, FDA, NIH or the new information does not change many minds.

The vaccine autism controversy also demonstrates another cognitive bias. Researchers have demonstrated that we ignore new evidence that proves an old idea that we once believed in is wrong[vii]. Our first conclusions have "sunk costs" because we have already organized our thinking around the possible risks from vaccines. We therefore discount the new evidence. Besides sunk costs, we may have cognitive dissonance if our belief that "we are good parents" is not backed up with new information. We think: good parents protect their children from harm and good parents vaccinate their children. In particular, new evidence that goes against our beliefs actually backfires. We believe our values are under attack and recommit to our beliefs. We accept information that supports what we believe in and reject that which does not.

Finally, there are two other cognitive biases in the vaccine debate: "reactive devaluation" and "the bandwagon effect." Reactive devaluation occurs when people do not value information or a proposal from an antagonist as highly as they would a proposal from someone they like.[viii] As the debate over vaccines intensified, people put themselves into different camps. Ideas that came from the other side were devalued. Moreover, if everyone around you believes that

vaccines are safe or not safe, then the information you select to pay attention to comes from your group—also known as the bandwagon effect[ix].

Decision-Making Biases

Not only do we screen out or ignore relevant information and take in information selectively, but also we use the "short cuts" to make decisions. Human beings are social creatures. Many of the informal reasoning strategies that help us make decisions come from our early evolutionary instincts (fight, flight, hide, camouflage) and from the social biases of our group. For example, the vaccine debate is replete with emotional and moral motivations. The different sides in the debate have made decisions by selectively gathering, remembering, and interpreting information. Motivated reasoning occurs more often when we have a strong emotional stake in the decision. We reason away any contradictory information because it is psychologically easier than revising what we value, feel, or believe.[x]

Ziva Kunda summarized research on motivated reasoning in 1990[xi]. She looked at how people assess information when they want their decision to be viewed as "accurate" compared to when they want to support a particular conclusion. In particular, she looked at how people reason in the two different situations. She found that wanting to be "accurate" only had a slight influence on their thinking. For example, researchers asked people with strong opinions (for and against) capital punishment and crime deterrence to view research. People who believed that capital punishment deterred crime assessed the relevant empirical evidence in a biased manner. They accepted "confirming" evidence at face value and criticized "discontinuing" evidence. They drew support for their initial and opposing positions from identical studies. Furthermore, the research strengthened their beliefs, and thus, increased polarization. In the vaccine debate, parents used motivated reasoning to assess research.

We are also highly susceptible to social influences when we are making decisions. Researchers have demonstrated a "framing" effect when we make decisions[xii]. We make different decisions depending on by whom and/or how a choice is presented. For example, we avoid or choose risks when the choice is framed as positive (lives saved), but we choose risk when the choice is framed negatively[xiii]. Parents who worry about the effect of vaccines on their children avoid the risks of neurological effects, which is a negative frame. Parents are willing, therefore, to take the risk. Meanwhile, the medical establishment frames vaccine choices as promoting health through vaccines, a positive frame.[xiv]

We respond to famous people, our family and friends, and people who seem like us. Our relationships help structure our decision-making. In the vaccine debate, one side was comprised of famous parents and groups made up of parents. The other side included people who identified themselves by their scientific or medical expertise. Parents used social media to communicate about the possible risks of vaccines to others in their network. This creates an "availability cascade" a self-reinforcing process wherein collective beliefs gain more and more plausibility as they are repeated[xv].

The vaccine debates also demonstrate "groupthink." Groupthink is a theory originated by Irving Janis. [xvi] Janis studied a range of groups debating information and making decisions. He noted that if a group culture supported harmony or conformity, then individuals rarely shared disagreements or new ideas. A group would rapidly form one opinion. He showed that group members try to minimize conflict and reach a consensus decision without critical evaluation of alternative viewpoints. Group members actively suppress dissenting viewpoints and isolate themselves from outside influences. Loyalty to the group ensured that individuals would not raise controversial issues or alternative solutions. Group discussions and solutions thus suffered from less individual creativity, uniqueness, and independent thinking.[xvii]

We know from many social circumstances that we are prone to stereotyping and in-group bias. These biases affect our decision-making. We remember information that conforms to what we believe is true about that group. When considering different information we pay attention to "markers" of people's gender, ethnicity, and race. The more complex the decision and the more the decision include strong values, the more likely it is that our in- and out-group biases will affect the decision. Our stereotypes make some information "stickier" because the decision is similar to what we already believe about that group.[xviii]

Researchers have repeatedly demonstrated the impact of stereotypes on decision-making. We rely on stereotypes as decision-making short cuts; our biases are unintentional and unconscious. We may believe that we are not prejudiced but we are vulnerable to the subtle cognitive and behavioral effects of implicit stereotypes. Stereotypes affect our memory, perception, and judgment. For example, the research shows that we remember information that is consistent with our stereotypes; information that is inconsistent with the stereotype will not be recalled easily.[xix]

It is unclear whether advocates in the vaccine debate have stereotypes about each other but it is possible that groups are holding anti-expert bias or stereotypes about parents' decision making. Furthermore, as groups become more polarized, people tend to make riskier decisions. Groups make risk decisions differently than individuals do. People make decisions and form opinions differently in groups than in individual situations. Researchers demonstrate that after participating in a discussion group, group members advocate more extreme positions and call for riskier courses of action than individuals who did not participate in the discussion. In the group, they are likely to make riskier decisions because people share the risk. Therefore, where it may seem risky not to vaccinate your own child, once you are in a group, the risks shift to the whole group.[xx]

Limited Information Processing Capacity

Finally, we only have so much capacity to manage information as we try to make decisions. Mental noise fills our minds. It becomes "white noise." We then use short cuts to cut through the complexity of information overload. "Bounded rationality" is the term that organizational psychologists apply to the processes humans use to limit the complexity in solving complex problems.[xxi] We simplify the choices first, and then make a rational decision. However, the

simplifying processes include many biases. No one is completely rational—we can only be partly rational and the remaining actions are irrational in their contexts.

Researchers have identified a number of heuristics that help us deal with information overload. Daniel Kahneman uses the term "System One" to describe the series of fast, subconscious, intuitive, and emotional short cuts we use to judge information and make decisions.[xxii] System One thinking associates new information with memories or existing patterns of thought.

If we can think of an example of an event or behavior, we assume it will likely happen. In other words, if we can recall the consequences of something analogous happening, we perceive those consequences as likely to happen. The availability heuristic is a short cut that causes us to over- or underestimate, based on our experience.

Kahneman also explains that we substitute simpler questions for hard questions to streamline our thinking. Another way we simplify decision-making is by focusing on "known knowns." Kahneman labels this phenomena "WYSIASTI"-what you see is all there is. We do not examine identifiable unknowns, even if they are relevant. We make decisions based on information that we have.

We also tend to see patterns in information that may not be there -- a "clustering illusion." Our ability to see patterns is a strength in our old evolutionary context on the Savannah, but our preference for patterns now allows us to be easily misled by random information.

All of these short cuts are automatic cognitive strategies we individually take to deal with too much information and too many choices. Complicated science and technical policy issues also demonstrate how group dilemmas complicate decision-making.

III. Group Problems

Schools throughout the United States struggle with strong opinions about how to teach how the world began. The creationism versus evolution debate has a long history in the U.S. dating back to the first statute in Tennessee in 1925. This statue prohibited teaching the theory of evolution in the state. Several other states followed with similar laws. In 1968, however, the U.S. Supreme Court struck down these statues under the Establishment Clause. Nonetheless, the controversy continued and led to the inauguration of numerous research, advocacy, and education centers to promote different viewpoints.[xxiii]

Different groups and religions challenge scientific consensus about how old the world is and how it began. These groups see science and religion as completely different views that cannot accommodate each other. Traditional public forums and decision-making processes create more polarization and make many science/value debates very thorny.

The Principle of Social Construction

Our knowledge of the world around us is interwoven with our psychological and social predispositions. Our reality is "constructed" during our interactions with people rather than in the mind of the individual. Rather than being immutable, our reality is shaped by the

conversations we have, the experiences that take place, the language we use, and the circumstances we find ourselves in. Understanding social construction helps us understand how groups shape us, how we arrive at our perceptions, and how we make decisions about complex problems.

Debates about evolution, climate change, and genetically modified organisms are driven by more than cognitive and decision-making biases. Social identity and radically different values escalate the divisions. Social psychologists and sociologists analyze group polarization and social conflict using "social identity theory."[xxiv]. Social identity theories state that human beings define who we are by our membership in social groups. The groups we grow up with and participate in shape our self-concept.

In the debates over evolution and creationism, we can see how intergroup conflict starts and escalates. The individuals in one group (the in-group) compare themselves to those of another group (the out-group).[xxv] Through comparison, we feel better about our group and ourselves. Over time, however, focusing on "our" group versus "their" group tends to exaggerate the differences in each group's views and foster stereotypes about the other group. The evolution and creationism debate shows how individuals and groups define who they are by who they are not: The two groups are focused on the differences between their viewpoints and stereotypes about what the other must be like to believe what they believe.[xxvi]

In 2013, a group of decision, risk, and legal scholars studied the polarizing of issues. They compared several theories to understand why people differed so much on issues that have science and value dimensions. Donald Braman and Daniel Kahan et. al. examined popular theories for why science-value debates are so polarizing. The researchers studied people's science literacy, their ability to use numbers analytically, and their cultural worldviews. They found that people with similar or no science literacy did not believe one way or another about science-value policy issues. They also found little support for the numeracy hypotheses. However, they found strong evidence that people with similar worldviews about social organization, inequity, and authority had very similar beliefs about the existence or seriousness of climate change.[xxvii]

For some, science and value differences are more important than the information itself because of the importance of the group. Because many of us depend on our social groups for material and emotional support, the most important determinant of our beliefs is what our group believes. This is especially true when the subject—evolution, climate change, GMO's--threatens the cherished values of our group.

IV. Knowledge Problems

Nature of Science

We may wish that science provided precise prescriptions on how to manage ecosystems and prevent cancer, but it does not. Philosophers and researchers have been adding to our knowledge for more than two thousand years but we still do not definitively understand our universe. Science and the scientific method are iterative; at each stage, chance, blind alleys, and

human error can come into play. Each discipline has a typical way of framing the problem and seeking answers, and they rarely agree on the approach or the findings. Controversy is an inherent part of how knowledge is tested and accumulated. [xxviii]

Scientists deal with the uncertainty of their findings through an iterative research process. As a community of researchers works on the same issue over a long period of time, they develop comfort about the limits of their research findings. When policy makers push scientists beyond their knowledge level, scientists are uncomfortable going beyond the interpretations their data supports.

In environment, energy, natural resource and public health management, as well as in policymaking, we have to rely on the best available information at the time we make decisions. While scientists are comfortable judging the reliability and validity iteratively, those working in the policy sphere keep pursuing more information--hoping that more will lead to better. Sometimes it does; however, often in the social, environmental, and natural resource arena, more information is just more to wade through.

Many policy scholars recommend adaptive management as an approach to inconclusive knowledge in light of the need to make policy decisions. However, it is unclear how often stakeholders are comfortable with this approach and with just how often new information actually improves original plans or policies, especially in the face of the countervailing needs for greater business and political certainty.[xxix]

Local Knowledge

Many environmental, public health, and natural resource problems are complicated by the difference between what locals know about the problem and what scientists and engineers know about the problem. Citizen groups and local people understand issues from their historic and direct experience with the resource or the place. The information is nested in relationships, tradition, stories, and observations.

It can be difficult to knit local knowledge with scientific knowledge in policy problems. However, without integrating them, decision makers miss important information.[xxx]

Science Policy Interface Problems

There are thousands of books, papers, conferences, and reports describing the gap between technical and scientific information and policymaking. Scientists do not understand policymaking; policymakers do not understand science; and neither of them understands what the public wants. These are the typical complaints.

Scientists rarely produce “consensus,” but instead rely on science conferences and peer review to question methods, data, and interpretations. The goal of science is to disconfirm hypotheses-not produce truth. As scientists conduct more research, they develop new hypotheses, methods, and approaches–not incontrovertible “truth.”

Knowledge and policy also do not connect well because the time scales differ. Technical and scientific knowledge accretes over a very long time, while policy makers rarely have that time. Policy "windows" change rapidly based on public perception, media attention, and political cycles.[xxxi]

Further, different disciplines approach questions or problems very differently. If one wanted policy prescriptions on how to set the level of a contaminant in the air, biological, toxicological, and epidemiological approaches would all be valid—but would be very hard to integrate. Each discipline has its own organizational history, theories, and approaches. While different disciplines can integrate research to develop complex knowledge, the process is difficult.

Even if the majority of scientists agree on the weight of evidence, advocacy groups, industry, and the media often highlight the outliers to strengthen their interests. It is easy to portray the information as inconclusive because of the nature of the scientific process. The outcomes of research are not truth, but better hypotheses and methods.[xxxii]

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V. Typical Science Policy Processes

There are three primary ways that are typically used to try and "pull" science into policy problems and policymaking. Some problems tap multiple processes.

Advocacy Science

First, advocacy groups, issue and cause organizations, and industry groups fund and attend to the research on and about their issues. Even if they did not fund the research, organizations and associations pay attention to technical and scientific information and new findings in their interest areas. In complex fields, academic scientists have left much of the science translation to their professional societies and advocacy groups. In North America, many organizations and associations translate complex ecological, toxicological, and medical research. Many of these organizations and associations have a particular perspective, based on the values, interests, and risk perceptions of their members.[xxxiii]

Advocacy groups and industry representatives attend to information that fits the hypotheses or theories they have about public problems. They also search for research that fits the way they have defined the problem or framed the solution. Having developed a causation model and a solution framework, they gather evidence, analyze the information, formulate and press their conclusions forward, and defend them from criticism.

Expert Panels

Government agencies and organizations sometimes convene "blue ribbon" and expert panels to review information, summarize the current state of knowledge, and develop agreements on relevant information for decision-making. While these panels may produce useful information,

they often fail to reduce differences over knowledge claims or produce usable information for implementable decisions.[xxxiv]

First, stakeholders are rarely involved in framing the problem that prompts particular information to be sought after or particular questions to be asked of experts. The expert panel may frame the problem and questions or the agency developing the policy may define the problems and questions. It is unlikely that the expert panel will completely capture stakeholder concerns. Therefore, the panel may miss important questions or overlook important information.

The panel may also conduct their inquiry without illuminating the models, data collection, or analytical methods. Even if the process is open to the public, the deliberations may not be understandable to observers. The expert panel may spend most of its time in very technical and academic discussions. Without understanding the information and its sources, some groups may distrust the process and the results will not be legitimate to all.

Adversary Science

Public hearings and legal proceedings often resort to expert witnesses to present the scientific information. Each special interest and industry group finds its own scientists to summarize and present the research and conclusions to bolster their own problem definition and solution. Discussions focus on undermining the credibility of the other scientists and their science. While advocacy science and expert panels produce some useful information, there is often little tangible public value in adversarial "expert wars."

Scientists may be coming from very different disciplines, using different models, collecting different kinds of data, and relying on very different methods for analysis. At a science conference, participants might discuss these differences in depth. In private, scientists may also sort through their approaches and develop new, joint understandings. However, in adversarial science, these different approaches seem to exacerbate public miscommunication and disagreement. The point/counterpoint formats lead the public and stakeholders to distrust all of the information. Even worse, people may conclude that science is not relevant to making policy.[xxxv]

Advocacy science, blue ribbon commissions, scientific conferences, peer review, expert panels, and expert witnesses are useful to sort through completed scientific and technical information. Unfortunately, these processes rarely include the public. Further, the experts rarely have a chance to discuss the information, analytic methods, and full models that sit beneath their findings. They seldom get to incorporate their scientific information with the information that local people have from their experiences as "problem holders" managing a resource or living in the region.

VI. Conclusion

To advance both science and policy, people tend to create theories and hypotheses (or their equivalents), gather evidence, undertake analysis, formulate conclusions, press their best

conclusions forward, and then defend them from criticism. This sounds good on paper. However, people do not realize that their seemingly rational processes are driven by more subjective processes. We routinely select or give greater weight to knowledge that suits our predispositions. We develop short cuts to sort through all the information we are bombarded with. We make judgments from information with personal hypothesis based on our beliefs and experience. Finally, we remember and use information that fits our experience and beliefs.

Simple, efficient judgments and decision-making rules are good enough for most of us, most of the time. However, these tendencies complicate our abilities to solve complex and highly politicized problems. The information required to understand energy, public health, natural resource and environmental issues is daunting. Social, economic, and ecological information—in combination with input about short and long-term uncertainties and risks—threatens to overwhelm the most sophisticated of us.

Improved training for scientists, policymakers, and the public, more funding for objective science policy translation, and improved processes for integrating science and policy, have all been suggested. Attempts to strengthen the policy science relationship are hard to implement across the scientific societies and policymaking venues. “Joint Fact-Finding” is an especially useful method because it is designed to overcome the barriers through a focus on specific problems and specific policies with focused and disciplined fact-centric dialogue.

Joint fact-finding addresses the cognitive biases of individuals, the inconclusive nature of knowledge, and the disjuncture between science and policymaking. Joint fact-finding focuses on the circumstances of each individual situation. It is not a cure-all for the larger current distrust in science, warring positions, and uninformed policies. However, successful cases over the last 15 years, demonstrate that joint fact-finding is a very useful strategy for reducing unnecessary friction and paving the way to greater discipline and effectiveness in challenging conflicts over energy, public health, environment and natural resource issues.

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[i] This paper is part of a larger collection of materials on Joint Fact Finding located at

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