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Deepening disagreement in engineering education

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ABSTRACT: This paper argues that deep disagreements stem from conflicting worldviews. In particular, I examine how recent moves in engineering education contribute to deep disagreement by inculcating students into valuing the environment as a key stakeholder in engineering design. However, some graduates who value the environment meet resistance from employers who hold a more traditional engineering worldview, which regards the environment as an externality. Clashing worldviews can, as Robert Fogelin posited, render rational resolution to argument impossible. Disputants must consider the emotional and rhetorical as means to move toward productive ground for argument. I offer two moves from classical rhetoric—making an exordium and invoking friendliness—as means to shift the frame of an argument and thereby possibly navigate a deep disagreement.

KEYWORDS: deep disagreement, engineering education, worldview, rhetoric, emotion, persuasion.

1. INTRODUCTION

As a field, engineering tends to present itself as a single unified entity wherein the participants share a common worldview that is played out in engineering practice. In fact, engineering encompasses a wide range of fields and worldviews that can conflict. Recent moves in education have repositioned the environment as a key stakeholder in design work and engineering thinking in such a way that students are educated into a worldview that is at odds with the more traditional profession. As new engineers emerge into the profession then, they encounter resistance between this new worldview and that of ‘the profession.’ These tensions can be characterized as deep disagreements because they occur at a level of foundational commitments that cannot be easily resolved.

In this paper, I explore the cases of three engineers¹ who have gone to work in industry and encountered worldview conflicts in one way or another. The concept of worldview enriches the understanding of deep disagreement because it helps to explain the grounds for intractability. The first two cases demonstrate failures to navigate between personal and professional worldviews, thereby raising the question of how to move past intractable disagreement. I briefly consider transcendence (Zarefsky 2010; Campolo 2005) and psychotherapeutic techniques (Friemann 2005) and then examine rhetorical approaches to creating intersubjectivity. A third case offers an example of how these approaches may help navigate the intractable in an engineering context.

¹ Although the cases are represented as individual cases, each one is a composite construction to retain the anonymity of participants in the research.

2. THE PLACE OF “WORLDVIEW” IN DEEP DISAGREEMENT

In Robert Fogelin’s classic article on deep disagreement, he asserts that, in ordinary disagreements, the parties share a great many beliefs and preferences that provide a framework in which “reasons can be marshaled” (Fogelin 1985: 3). However, deep disagreements occur when such beliefs or frameworks are not shared. These disagreements are not disagreements on a single point such as should we do X or Y—although they will manifest themselves in just such apparently mundane points; rather, they are disagreements that are grounded in what he variously terms “framework propositions” or “Wittgenstein’s rules,” but which seems to encompass: “not simply isolated propositions, but instead a whole system of mutually supporting propositions (and paradigms, models, styles of acting and thinking) that constitute, if I may use the phrase a form of life” (Fogelin 1985: 6).² Even as he introduces the idea, Fogelin expresses his own distrust of it because it presupposes a singularity and uniformity of idea that is inconsistent with our experience of other humans who are sometimes and on some things rational and trustworthy, but on others not so. Fogelin, thus, prefers a sense of “forms of life” in the plural.

The concept that Fogelin seems to require here is the idea of “worldview”—from the German “*weltanschauung*”—a concept initially articulated by Kant but more fully developed by others through the 19th and 20th Century. This concept captures both the sense of a system of propositions and the idea of the need for a plurality of forms.

Perhaps the clearest recent explicators of the idea are theologians Brian Walsh and Richard Middleton (1984), and N. T. Wright. Wright explains worldview as (1) a story or narrative construction “through which human beings view reality” (Wright 1992: 123), such that (2) it explains the basic life questions – “who are we, where are we, what is wrong, and what is the solution?” – and (3) is embodied in symbol or ritual. Finally, (4) it includes “praxis, a way-of-being-in-the-world” (Wright 1992: 124). This last aspect is particularly important for understanding the limits of argument and the grounds of deep disagreement because praxis is the acting out of deep-held convictions that reside at a level that relates to a “presuppositional, pre-cognitive stage of a culture or society” (Wright 1992: 122), or individual. Because worldviews are “presuppositional” and “pre-cognitive”, they do not easily bend to rational argument; moreover, for the same reasons they are particularly powerful and shaping for the individual and society.

² Gilbert uses the term “positions” to describe a similar phenomenon, which he defines as “a matrix of beliefs, attitudes, emotions, insights and values connected to a claim” (1997: 105). Campolo and Turner (2002: 13) use the phrase “global picture” as a near synonym. All of these terms seem to me to be absorbed within and enriched by the concept of worldview.

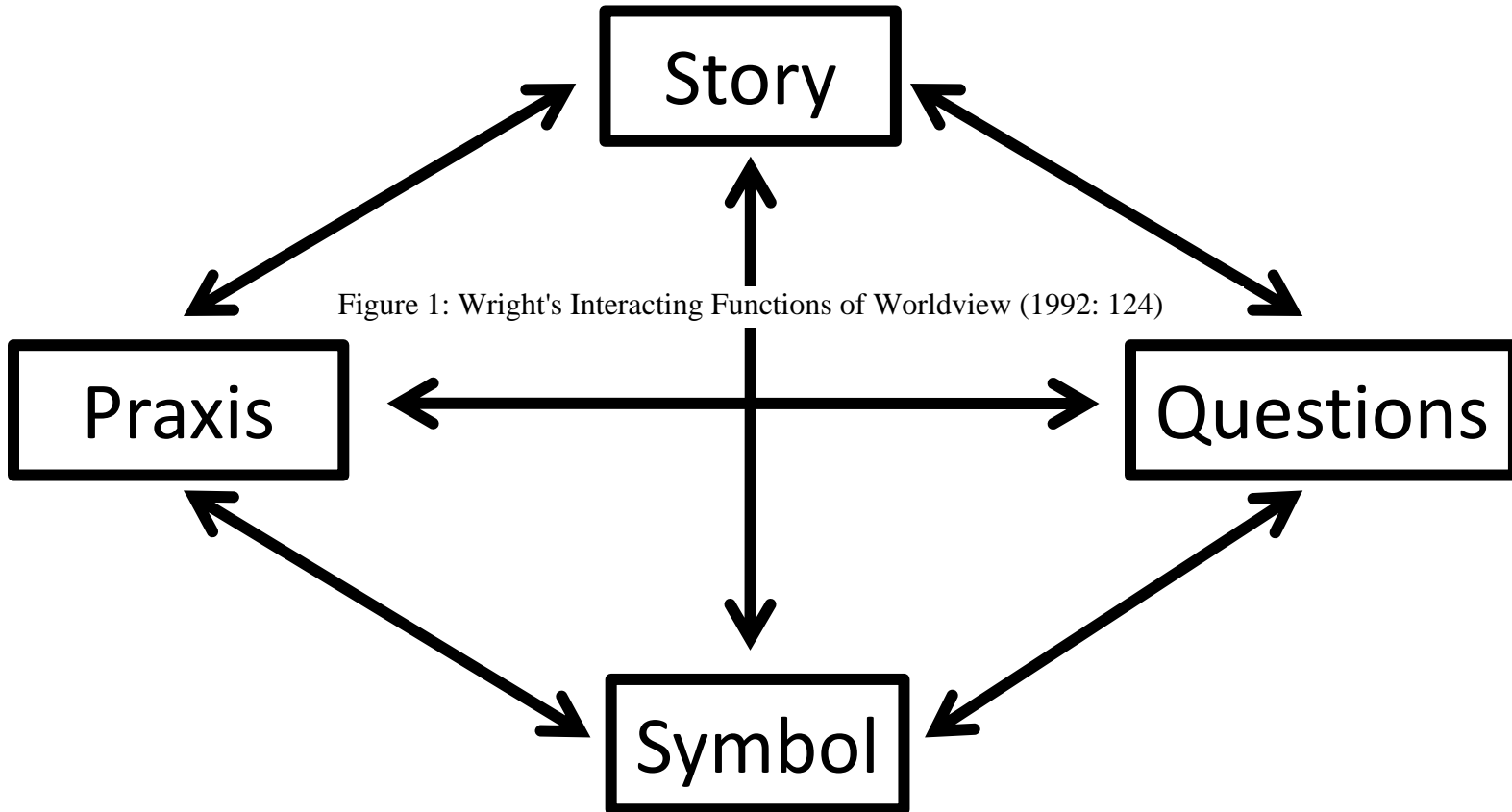


Figure 1: Wright's Interacting Functions of Worldview (1992: 124)

Worldviews are at once culturally shared and individual. That is, an individual participates in a worldview that is the story of a culture and embeds a set of values, symbols and practices to answer the basic questions in a particular way. The story operates at a sub-conscious or pre-cognitive level not only to offer a fundamental explanation of how one should live and belong as a human being but also to define membership in that culture. As such we can speak of a worldview of a particular people group in terms of its shared story, practices and its particular way of answering basic questions.

At the same time, an individual inhabits a unique worldview that is his or her story lived in interaction with various competing interests in that individual's life. So, for instance, the agnostic son of a Christian religious family may celebrate Christmas, despite that his own religious experience is only a cultural inheritance, rather than a shared belief system. For him, as for much of the Western world, the "symbol" of Christmas shifts from an overtly religious event of a deity's incarnation to a more generalized cultural celebration of "good will". So, the son at once shares in an inherited religious worldview and a lived cultural worldview. The two overlap as different "forms of life" but coincide into a unique worldview from which the son operates. In doing so, of course, the son's worldview could come into conflict with either the inherited worldview – perhaps he is disinterested in the religious rites of the season – or the cultural – perhaps he expresses a degree of religiosity (or its opposite) out of keeping with his peer group. In either case, the disagreements here are unlikely to be deep or significant due to both the degree of overlap between the worldviews and the individual son's lack of strong conviction. His parents, on the other hand, might well wind up in stronger disagreement with the broader cultural

worldview because their commitment to their worldview puts their practice at odds with it. Thus, Worldview shapes the individual, in part because it is not just individual but collective.

Worldviews are thus the basic stuff of human existence, the lens through which the world is seen, the blueprint for how one should live, and above all the sense of identity and place which enables human beings to be what they are. To ignore worldviews, either our own, or those of the culture we are studying would result in extraordinary shallowness (Wright 1992: 124).

So, it is really no surprise that we find worldview at the intractable limit of argumentation. It is the unexamined point beyond which be dragons.

Worldviews can, in fact, be examined and can change, but “Global pictures don’t get changed (or replaced) by arguments alone” (Campolo and Turner 2002: 13). Transforming a worldview often requires some kind of a crisis or “shock”—a death, a birth, a marriage, a divorce, a failure, or an empty success can all create the necessary conditions for change.

To return to my simple example, if the agnostic son decides not to come home for Christmas, it may be a result of a worldview shift. We cannot tell from the act (praxis) alone. In Burkean terms, we also need to understand purpose and agency (and perhaps scene as well). For instance, if the son *cannot* come home because of a new job (lack of agency), then no conflict results, and the family itself can forgive the breach of protocol as a career necessity. Similarly, if the son chooses not to come home because he is going to his fiancée’s family for Christmas, this purpose can be understood as competing family values—as such it is forgivable (if lamented). However, if the son does not come home simply because he does not want to celebrate Christmas, he creates a set of existential questions for the family: Is it just adolescent rebellion? Does he not love us? Has he, indeed, abandoned the tribe? Has he, in fact, adopted a contrary worldview? Such questions can begin to shake a family’s sense of itself—its *worldview*. However, should that same son appear at the next family gathering as expected, the previous view will likely be reinstated with the missed Christmas seen as an aberration. One missed event would be unlikely to provide sufficient shock to uproot the family’s worldview.

Education can also play a role in transforming worldviews—indeed, it may be the chief catalyst to generate movement from a received worldview to a more reflective worldview. If for instance, the son in our example has taken a sociology course in which he has learned about narcissistic family structures and determined that his own family is just such an entity, he may choose not to go home in order to begin a process of healing. He may even seek counselling to sort through the precognitive stage, bringing it into light. Thus, the son’s worldview is beginning to change, and in the process it will impose some kind of change on his family as well. His set of framework propositions has changed as at least one aspect of his worldview is being examined.

Examining one’s worldview can often bring change simply through the process of looking. With new ideas—as in education—the possibility of change emerges. It doesn’t need to be as personally wrenching as discovering one’s family is dysfunctional. However, when changes occur, the individual’s grounding story changes, answers to the basic questions change, symbols begin to change or change their meaning, and praxis changes. Thus, the shifting of worldview resembles the outcome of reasoned argument. Indeed, in argument, reasoning depends on just this sort of negotiation.

Worldview, then, can be defined for our purposes as the individual or collective narrative construction that answers basic pre-cognitive questions and is embodied in symbolic artefacts or events. Such a worldview is enacted in praxis that in turn shapes both the individual's story and that of the larger collective. The value of adding "worldview" into the discussion of deep disagreement is that it allows us to better understand the "system of mutually supporting propositions" that creates the intractable situation of deep disagreement, by demonstrating that the basis of such disagreement is fundamentally opposed framework propositions.

3. CHANGING WORLDVIEWS IN ENGINEERING

A shift in worldview is in progress in engineering education. This shift is occurring more broadly in North American culture but it creates, perhaps, more visible clashes in engineering. The shift can be encapsulated as a shift to a more environmentalist worldview. Whereas prior to 2000 the environment was regarded largely as an "externality" – something that could safely be left aside from fundamental design considerations – the environment is now regarded as a key stakeholder. Indeed, because the environment itself has no "voice", it must be given particular privilege at the table. This change is causing conflict at a foundational level for individuals and, ultimately, for the profession.

The engineering discipline has, for most of its existence, thought of itself as "the practical science." In keeping with such "practicality," the discipline has largely eschewed an "ideological" stance or any sense that its students are inculcated into any kind of professional "worldview." In effect, such disavowals support an implicit worldview that operates at a pre-cognitive level, just as Wright suggested. That worldview remains largely a modernist belief in progress and development, and a belief that science holds the answers to the world's questions. As such, engineers see their responsibility to solve the world's problems because they see themselves standing at the juncture between science and its application. By and large, engineers take this responsibility very seriously.

Perhaps because of this responsibility, the profession conveys a kind of arrogance. Engineers regard themselves as superior, even outside their sphere of expertise. So, for example as recently as December 2010, the following appeared in an article by a retired engineering professor in an on-line news weekly:

In Canada and the US most politicians are lawyers. But engineers are wealth generators, problem solvers and civilization builders; we need more of them in politics. Engineers have quantitative skills, and understand constraints and trade-offs. They are trained to manage within budgets. They know the value of teamwork, and in many engineering projects, interdisciplinary teams are necessary. They know if ethics are compromised, and in any public project, that could lead to disasters. And believe it or not, engineers understand economics, and its mathematical foundation, more than economists. Engineers appreciate policies and procedures more than lawyers; in engineering design work not all decisions are purely technical. (Elmasy 2010)

Although we might bristle at the gross generalizations and unsubstantiated claims, this attitude is not only encouraged through various forms of indoctrination in engineering schools but is also prevalent in the profession. At the same time, an almost contradictory stereotype exists: the engineer as technical geek. Engineering students often embrace this definition, in part because they regard technical knowledge as superior to "soft skills." So

again, the view supports a naïve sense of superiority rather than an informed or reflective worldview. Thus, a traditional worldview of engineering sees the engineer as technical problem-solver, perhaps socially inept but still superior to other, less technically-minded people. The world would be a better place, so the story goes, if the engineers were in control and others let them make the trains run on time.

In contrast to the traditional engineering worldview, a new movement has emerged in engineering in the last twenty years, gaining real ground in the first decade of this millennium. That move aims to situate the engineer in his/her broader context of the environment, the human system, and the global community. My own university has, in the last 15 years, developed programs in leadership, global engineering, environmental engineering and communication. On one hand of course, these could all be seen as fulfilling the traditional story. On the other hand, all of these programs recognize that the nature of the profession is changing, and with it the demands on the professional. In addition, most university engineering curricula now have significant considerations of these broader contexts, particularly the impacts of engineering on the environment. Environmental sustainability is now considered a key requirement in engineering design, whether considering alternatives to lead-based solder in microcircuits, non-carbon energy sources or sustainability in large-scale construction.

These changes are having an impact on the attitudes and worldviews of new engineers entering the profession. Evidence of this change is an initiative developed by students at the University of Toronto called “A Promise to Future Generations” (2009). Modelled on Jacques Cousteau’s “Bill of Rights for a Future Generation,” the “Promise” asks engineers to commit to considering the environment and the sustainability of any actions in order to preserve the earth for future generations to enjoy. This commitment is made by students as they graduate. As with most such documents, it uses inspiring rhetoric but is short on practicalities. Thus, it sets up the potential for conflict.

4. DEGREES OF DISAGREEMENT IN ENGINEERING

Generally, engineering is not a field of open conflict. Corporate structures tend to be hierarchical. Young engineers are expected to learn from supervisors—indeed Professional Engineering Certification (P.Eng.) requires a relatively lengthy apprenticeship. In subtle ways, this process entails enculturation into the professional worldview. However, it assumes the new engineers come into the field ‘primed’ to join. When an engineer has a competing worldview, the possibility of a clash exists. The first two cases demonstrate differing aspects of how clash worldviews can cause deep disagreements in the workplace.

Case #1: Bradley—Disagreement Internalized

Bradley has a strong environmentalist worldview. His personal life embodies a praxis consistent with that story: he has chosen to live along a transit line so that he does not need a car; he regularly makes energy-conserving lifestyle choices. After graduation, it took Bradley some time before finally finding a job with a civil engineering firm. He is part of a transportation group working on road renovations and modifications, bridge reconstruction and traffic plan management. Most of his work he has been doing calculations for road widening or other means to handle more traffic.

Bradley is frustrated and feels trapped. He did have an opportunity to work on a proposed High-Occupancy Vehicle (HOV) lane, but otherwise he does work that supports a car culture he has rejected. He is afraid to speak up because he does not want to lose his job. Although his company is busy, friends have been laid off at other companies. He is aware that his company's business is largely due to government infrastructure funding. So, Bradley has internalized his disagreement. His worldview story is filled with convictions that answer his basic questions, but his work praxis conflicts with his inner narrative. At the same time, he values the work experience toward his P.Eng. Bradley's situation could be seen as a case of internal deep disagreement with two intractable claims:

- (A) A true commitment to the environment is enacted consistently across all areas of one's life.
- (B) Work experience is important to develop one's career.

Of course, these two claims address completely different questions. Yet, that is the point: the two questions—'can I satisfy career aspirations?' vs. 'can I live out my environmental convictions?'—create what Middleton and Walsh call "a kind of spiritual schizophrenia ... Such a condition cannot go on indefinitely without causing problems" (1984: 32). The two conflicting claims are not governed by a unifying principle or position. Of necessity, Bradley will eventually reach a point of resolution. Whether he does so without causing problems is another matter. He may have to give up either a job or personal convictions. Will such a choice be a rational decision? Perhaps, but more likely it will be made at a precognitive level as the worldview shifts due to another countervailing influence.

Case #2: Grace—Conflict Unresolved

Grace graduated as an environmental engineer. She worked for 8 months as part of a consulting firm; however, she found herself continually compromised. She understood her role as ensuring the environmental sustainability of various kinds of development; however, her supervisor insisted that Grace's role was to "find a solution" to the environment as a problem (this was Grace's perception). A wetland was a drainage problem, and developing in a protected greenbelt was a legislative problem. Grace's commitment to the environment as a legitimate stakeholder in development created conflict. She resisted what she saw as her manager's cynical acquiescence to the status quo; she vocalized her complaints and offered alternative proposals for what she saw as more responsible development. With little success and substandard evaluations, she quit in frustration. She felt that she could not do her job and maintain her integrity. The environment was at stake, but its value was unacknowledged. She applied to return to school for graduate work in environmental science hoping that more education holds the key to being able to make a difference.

Grace's supervisor assumed common understanding as basis for reasoning through the "problems" in land development. Thus, when Grace put up resistance of various kinds, he saw her as just being pigheaded. Likewise, Grace thought that if she simply spoke up, her supervisor would see the obvious. When he didn't, she assumed he was pig-headed. This situation does not create a strong basis for rational argument. A number of factors undoubtedly contributed to Grace's difficulties. She is assertive. She is a woman in what is still a male-dominated environment. She is passionate, which is seen as weakness in the data-driven environment of engineering. She voiced complaints before

alternatives. She was continually trying to reframe the question away from the one she had been asked to address to one that allowed room for environmental responsibility.

Consider the following discussion that occurred early in Grace's working relationship with her supervisor. Grace had been asked to calculate expected flows for drainage channels to manage water flow through the proposed drained wetland.

- (1) Grace: I can't do that.
- (2) Super: What's the problem?
[An initial show of concern is focused on expected technical difficulties]
- (3) Grace: We don't even know what is in that wetland habitat. I was just reading about a salamander that's endangered in this area. This could well be its habitat.
- (4) Super: The area is slated for development.
[The supervisor feels he has completely addressed the concern by citing legislation.]
- (5) Grace: What about plant species that might be affected?
- (6) Super: That's not our concern here.
- (7) Grace: *[becoming more passionate]* Whose concern is it?
- (8) Super: *[exasperated]* Just do the calculations. *[Supervisor walks away]*

This conversation occurred before the supervisor established a more circumspect approach to Grace's resistance. Indeed, it seemed to set a pattern for their relationship such that the supervisor would justify a decision and then dismiss any concerns. From this discussion, we can learn at least three things about deep disagreement in the workplace.

First, the two interlocutors do not establish common ground. They are at cross-purposes. Grace immediately judges her task from an ideological position. The supervisor interprets her statement as a technical inability. For the supervisor the issue is technical: "can it be done?" whereas Grace's concern is ethical: "should it be done?" The supervisor's response at turn (4) is an appeal to authority to indicate no further thinking is required. The authority makes it a necessity. For him, the ethical matter is settled externally, a point he returns to at turn (8). For Grace, that authority does not carry the moral imperative she is looking for. On the other hand, Grace refers to an external authority at turn (3), but her authority carries no weight with the supervisor. Thus, not only the point of contention but the reasoning behind the argument remains obscured because of a lack of common ground. Without common ground, the rift will be unbridgeable. Each finds the other pigheaded, but at root we can understand this as a "clash of framework propositions" (Fogelin 1985: 5). Although Fogelin proposes that pigheadedness could be evaluated by "an impartial observer" (1985: 5), impartiality is problematic given the inescapability of a worldview.

Second, the supervisor regards Grace's objections as outside the frame of the discussable. Animals, even endangered ones, and plants do not fall within scope, because they do not impinge on the doable. Grace was unable to make her objections count as legitimate because she was unable to shift the framework of the discussion to include environmental elements. This failure is both a matter of substance—why select salamanders?—and style: Grace began with a negative judgment and assumed she could simply raise the concern and be heard. Indeed, one might reasonably suggest that Grace simply needed some instruction in handling this sort of discussion, but the key here is that from her own worldview Grace was unaware that she was impinging on the boundary of her

interlocutor. Greater rhetorical savvy might have enabled a different style, but not a different set of framework propositions.

Third, by ruling Grace's concerns out of court, the supervisor imposes his worldview as operational. The argument—whether emotional or rational—is undermined by the power differential between the two interlocutors. The supervisor is in a position to impose his will (until Grace quits, of course). By doing so, the disagreement is suppressed and Grace's worldview is dismissed. This forces the conflict back onto Grace as an internal conflict—much like Bradley's. However, unlike Bradley, Grace never remained silent, and as Middleton and Walsh noted, that condition could not go on.

Certainly, engineering draws on prior experience—that is fundamental to engineering thinking, to efficiency, and to making 'engineering judgments.' However, reasoning in engineering is an equally essential (but seriously underrated) skill. Only with clear reasoning can engineering design ward off cookie-cutter repetition. Without clear reasoning from research and expertise (not just experience), engineers are doomed to repeat past designs and their errors rather than problem-solve and innovate. Grace's and Bradley's experiences both offer evidence of that. In Bradley's work, road widening simply involves calculating needed additional lanes based on traffic volumes without asking how traffic volume might be reduced or how people might be moved by an alternative means. Grace's supervisor saw development as a simple task, leaving the ecosystem out of the equation. Thus, in some sense, the engineering in these two cases has stagnated because reasoning has been diminished. It has become mere implementation of prior engineering rather than a generative engineering process.

Reasoning in engineering is always controlled by the process of problem-framing. This early step is essential in design work. If the problem is well framed, it opens possibilities for design. If the problem is poorly framed, the solution may exist *a priori*, leaving little room for critical or creative thinking, and increasing the likelihood of failure. Problems get framed by people who are socially conditioned to think in particular ways—they have a worldview. One can only address a problem as it is framed, so the ability to reason is limited by an engineering worldview. Without expressing it explicitly, both Grace and her supervisor appealed to worldview in their disagreement. In the supervisor's worldview, the environment was an externality, whereas in Grace's worldview, it was a key constituent. To move past this ideological impasse, reframing is vital. The question, however, is how to prepare the ground for such reasoning.

5. OPTIONS FOR ARGUMENTATION BETWEEN WORLDVIEWS

As Fogelin noted, deep disagreement stems from a lack of common ground on which to base the argument because the conditions for argument are "a shared background of beliefs and preferences" (1985: 5), whereas deep disagreements "cannot be resolved through the use of argument, for they undercut the conditions essential to arguing" (5). Engineers expect to have a shared context, and the myth of such is encouraged through various bonding activities during school and an unusually strong alumni and professional bond. However, the assumption of what is shared—both in expertise and in the framework for reasoning—does not hold because training has changed and because reasoning occurs within a worldview, which is, in part at least, inculcated through the education process. The changes in education (from grade school onward) are generating a different-

ly minded engineer. Some of this is simply generational—the millennial generation as a whole is more aware of environmental concerns than their parents. Some, however, can be attributed to the educational milieu in which the environment is presented as a significant stakeholder in almost any project, and sustainability is a value.

Campolo and Turner have noted that trying to reason when there is a lack of common ground is dangerous: “One of the most effective ways to damage our [reasoning] skills involves pressing them into service at the wrong times, or in the wrong circumstances” (2002: 4). Not only can it lead to poor conclusions, but it can also lead to misology (17). If either occurs in an engineering context, the consequences are serious. So, when worldviews conflict, what are the alternatives? How can the profession navigate successfully forward to incorporate new ways of thinking when the process of reasoning is hitting against differing ways of grounding reality?

A number of possibilities have been explored for navigating deep disagreements. David Zarefsky (2010) has suggested four means of “transcending” disagreements:

- exposing inconsistency,
- packaging to incorporate or subsume a lower level of argument in a higher,
- allowing time to either exhaust the argument or bring it to a crisis, or
- discovering new ground.

The problem with the first is that it is likely to lead to anger and greater intransigence due to what Richard Friemann calls “emotional flooding” (2005: 57), creating what Manfred Kraus (2010) calls “dialogues of the deaf.” The second Christian Campolo cautions against as being “far-fetched and dangerous” (2005: 37). The third will occur within the engineering profession eventually as the emerging engineers’ worldviews become normalized within the profession, but may not move things along fast enough to prevent serious environmental degradation, leaving only the fourth as a possibility with any traction for near-term success.

Ironically, the two manoeuvres for discovering new ground that Zarefsky pursues are the two that caused the trouble in the first place: inter-field borrowing and frame shifting. Borrowing concepts and partnering in research with such fields as environmental science, chemistry, and biology have encouraged a change in engineering thinking in the academy and in emerging engineers. Frame shifting is exactly the kind of exercise that the emerging engineers are seeking to do, but which is being resisted. Frames are, after all, constrained by and constrain worldview. If the frame shifts, so does the view. The fact that these manoeuvres have caused the trouble does not preclude them from being part of the solution. What is less apparent is what field will offer an acceptable source for borrowing in a way that will not immediately raise the resistance from the traditional engineering worldview. Hence, frame shifting seems to hold some promise, but As Zarefsky himself concludes, “None is assured of success.”

Richard Friemann has investigated using psychotherapeutic techniques to get to the deeper level of an argument that may get past disagreement. In his example (drawn from Gilbert 1997), he shows that one of the interlocutors (Cynthia) sees an apparent inconsistency in the other’s argument, but that she eventually recognizes that it masks a deeper issue, fear (2005: 56). By using “position exploration,” Cynthia is able to discover new ground that may potentially lead to a resolution. Thus, Friemann illustrates tran-

scendence at work. So, perhaps, if Grace were able to explore her supervisor's position, she might discover that his unwillingness to consider the environment results from an anxiety about his own lack of expertise to evaluate environmental considerations. Some of this may, indeed, be occurring in companies such as Grace's where new departments are emerging that have the environmental engineering as their mandate. Grace was, of course, unable to make that move because she had already put him on the defensive and the supervisor pre-empted further discussion.

Significantly, the new ground that Friemann proposes is emotional ground. The discussion shifts from the issue of naming a magazine to fear about increased expectations. In any clash of worldviews, we can certainly expect emotions to come into play, so understanding a move like this is important. However, Friemann labels one of Fogelin's classic cases as a "sterile relationship" (p. 62), in which the psychotherapeutic techniques may not be useful. Despite his suggestion that such relationships are "atypical," that sterile case seems most similar to the engineering context where emotions are by-and-large withheld from discussion. Indeed, the likelihood of a supervisor confessing fears to a recently hired engineer-in-training is low. Even among engineers whose experience has been more positive than Grace's experience, emotional connection was not the means by which disagreements were bridged.

6. MANAGING EMOTIONS AS AN ARGUMENT STRATEGY

Insofar as deep disagreements are worldview disagreements, they have an element that is precognitive and presuppositional, not rational. Indeed, an unexamined worldview is likely to have significant emotional buffering to protect against potential threats. When our worldview is challenged, we are likely to respond emotionally—anger, contempt, frustration, perhaps masking hurt or fear. Hurt because someone is treading heavily upon our close-held convictions; fear because those convictions may not withstand the stomp. As such, whatever the claim, if it threatens our worldview, we are likely to respond emotionally. If emotional flooding occurs as Friemann describes it (2005: 57), then the possibility of shifting frames is significantly diminished. Moreover, to extend Friemann's point, people will tend to replay emotional patterns in "perpetual problems" (61). At this point, therapeutic techniques may be of value to manage the deep disagreement (62). However, "managing" the deep disagreement may be insufficient if the issue is an engineering project where the environment may or may not stand as stakeholder. So, to resolve deep disagreement in such a context, we must look past rational argument or means to delve into emotional causes to find possible means of frame shifting. At this point, then, the logician needs to give way to the rhetorician, or as Fogelin puts it we "fall back on persuasion" (1985: 7).

While Friemann has turned to recent emotional theory to help understand what is at issue in trying to navigate deep disagreement, I find value in the opposite direction (historically). The ancient rhetoricians understood the importance of managing emotions in an argument. My hope is that the rhetoricians might show us some means to get around emotional flooding or other defence mechanisms that make worldview disagreements so intractable. I wish to suggest two rhetorical moves that might help move past the initial points of deep disagreement to allow discussion and—possibly—frame shifting.

6.1. *Making an Exordium*

The exordium or introduction to a speech is an important move. It involves a series of significant questions, such as:

- Make a direct or indirect approach to a subject (overt or covert)?
- Use humour or appeal to seriousness?
- Outline one's credentials or not?

The importance of the exordium is that it frames the discussion; that is, the exordium determines what framework propositions are considered legitimate within a given discourse. As such, it is a significant positioning move with respect to the way worldviews are engaged in an argument. If the exordium is mishandled, then the subsequent discussion is either constrained or requires more significant negotiation to broaden the framework. Poor exordial choices potentially create barriers, resistance or inattention (Andrews et al. 1998). Successful exordial moves help to establish the possibility of common ground for argumentation. In situations where competing worldviews make such ground hard to find, the exordium becomes particularly important in at least deferring negative responses.

The *Rhetorica ad Herennium* (attributed to Cicero) offers this advice: "In the introduction of a cause we must make sure that our style is temperate and that the words are in current use, so that the discourse seems unprepared" (Cicero 1954: I.vii.11). Immediately, two attributes of the exordium are evident: seeming reasonable and seeming unprepared. In both cases, the arguer must "seem" within our interlocutor's framework of reasonableness and preparedness. Someone who wishes to shift the frame to new ground must also maintain "an intimate connection with the Statement of Facts" (Cicero 1954: I.vii.11). What counts as fact, of course, is conditioned by worldview. Endangered salamanders did not count for Grace's supervisor. By bringing salamanders into the discussion, Grace veered from the accepted 'statement of facts' and lost the possibility of reframing the discussion. Because salamanders were non-entities to her interlocutor, concern for them seemed unreasonable. It was not a good exordial move—in her case such early missteps coloured all future discussions with her supervisor.

Now one might hear the objection that shifting ground without mutual consent of the interlocutors violates the listener in some way (for just such a criticism see McPherson's response to this paper); however, if the status quo ground of argument is untenable for an interlocutor, then the goal is to create ground on which discussion can be engaged. In a deep disagreement – or even where the disagreement only seems deep – that ground will be foreign ground for one party or the other. Obviously, the party who is able to establish the "home turf" for argument has an advantage, but this need not require deception. It is simply how the exordial move works.

6.2. Establishing "friendliness"

Aristotle presents a somewhat Machiavellian approach to friendship in that his interest is in how to *produce* friendliness in an audience. His explanation of friendliness begins benignly enough: "A friend is one who loves and is loved in return" (Aristotle 1991: 1381a). He lists many features that produce friendliness. For instance, friends share each others' joy and grief; they share enemies. They are ready to make or receive a joke, share similar interests or share in doing good deeds, etc. However, his point is not only that a

speaker can demonstrate that people are friends but to “make them so when they are not and refute those claiming to be and bring those who through anger or enmity are on the other side of the case over to whatever feeling he chooses” (1991: 1382a).

The implication here is that friendship is something that can be managed in order to accomplish a persuasive goal. As Aristotle notes: “things do not seem the same to those who are friendly and those who are hostile, nor [the same] to the angry and the calm but either altogether different or different in importance” (1991: 1377b). That is, judgment is affected by emotions. The logician may rankle at such manipulative tactics, but as Friemann has observed, “feeling is not really distinct from thinking” (2005: 53). Campolo speaks of what he calls an “interpretive circle” in which “the solidarity we enjoy at a given moment shapes how we perceive the ‘event’ which interrupts what we’re doing, shapes our judgment about whether or not our common competences contain the resources required to overcome the interruption” (2005: 48). So, if one is attempting to discover new ground in order to proceed through a deep disagreement, then such a move as engendering friendliness may be important. It is clearly missing from Grace’s failure with her supervisor. Neither Grace nor her supervisor made any attempt at friendliness, which had the effect of poisoning the work environment in a negative interpretive circle.

Case #3—Alex: Navigating Past Disagreement to Compromise

Another case can illustrate this difference. Alex was an environmental consultant on a condominium development project. The developer was extremely concerned about cost, but brought in the environmental group because he wanted to be seen as a “green” builder—without actually going to the expense of building in a truly green fashion. He was looking for a “minimum path” to look like he was environmentally aware. Initially, the developer’s idea was to do some landscaping around the building to create the appearance of integration with the environment. Despite this cynical starting position, Alex made several significant environmental gains: he persuaded the developer to change the planned orientation of the building to improve passive solar heating and to use different materials to allow for solar water heating on the side of the building, and implemented solar panels on the roof. The outcome was expected to reduce conventional energy use by 15-20%. To get the developer to agree, Alex knew that he had to speak the client’s language—economics, and cost-benefit. Alex recounted a conversation with his supervisor and the client. The interaction demonstrates an effective use of exordium and strong attempt at building friendliness based on shared interests.

- (1) Alex: Well, based on our modelling, I think we can gain some significant savings.
[Alex’s first term is “reasonable” to the developer because he speaks in terms of “savings.” His savings are energy, but his exordial strategy still works.]
- (2) Super: Why don’t you explain what you’ve found?
[The supervisor enhances Alex’s credibility by portraying him as a “discoverer.”]
- (3) Alex: Do you want to start with the small stuff or the really big one?
[Alex creates the appearance of sharing an informal and unprepared discussion. Again, this exordial move engenders a sense of reasonableness and good will.]
- (4) Client: Let me know the big one.

At that point, Alex explained how re-orienting the building would improve its ability to harness solar power. This change was possible without requiring significant changes in permissions from the city or slowdowns to the planned construction timeline, because it did not alter the footprint of the building and did not encroach on property boundaries. Alex demonstrated his reasonableness by being thorough. The result of this shift would be a saving in heating costs and creating potential for other benefits: materials selection for flooring and exterior cladding, a common solar water-heating system for the building, and installing automated solar blinds on all windows (to keep heat in during winter nights and out during summer days). This last is a new technology that has not actually been implemented on a large scale. The exchange continued:

- (5) Client: You mean the owner doesn't control their own blinds?
- (6) Alex: No, they're controlled centrally to maximize efficiency.
- (7) Client: But they couldn't look out their window when they wanted. I can't imagine a buyer going for that.

[Alex has not recognized that this point is a stopping point for his audience.]

- (8) Alex: Well, I suppose we could work out some manual override, but...
- (9) Super: We don't have to go that far. We can leave the blinds manually operated by each owner. The other savings would still make the building one of the most efficient in the city. I think that can be a selling point.

[The supervisor intervenes to keep the discussion on track. He returns to economic language. Alex is 'pissed off' that he didn't support this point.]

- (10) Alex: Well, if I was looking for a condo, I'd think it would be great to live in a place that was doing everything it could to save me money and be sustainable.

[Alex's last gambit is to portray himself as a potential buyer. This move is an appeal to Alex's ethos, as a person of practical wisdom (phronēsis).]

- (11) Client: I'm not sure everyone else thinks like you.

[The client rejects the move by appealing to his own ethos as having superior phronēsis, essentially undermining Alex's claim of practical wisdom]

Perhaps, this situation is simply not a deep disagreement. However, Alex's perception was certainly that his team was being brought in for image management not substantive change. He understood his interlocutor to have a fundamentally different objective, yet he did manage to advocate for substantive change. Certainly, the engineering culture was already different from that faced by Grace because Alex's supervisor was supportive—he and Alex shared a worldview. Moreover, they understood the client's position—unlike Grace with her supervisor. This combination added weight to the worldview expressed through Alex's ideas. Unlike Grace, he was not isolated as naïve and unrealistic. There was a common ground to start from: both parties understood that the development would go forward, thus the question was not whether but how. This at least meant that, unlike Grace and her supervisor, the two parties could ask the same question.

Another fundamental difference from Grace is that Alex was prepared. He avoided the clash of worldviews. He used exordial strategies to create good will. He engendered friendliness by his thorough and thoughtful regard for the client's needs. Thus, Alex was able to shift the frame for the discussion to include environmental responsibility.

ity. Once the shift was made, the developer was persuadable. With solid reasoning—reduced energy consumption can add value to the units—the developer could accept significant changes to improve the environmental design of the complex. However, the fundamental point of disagreement remained between the developer and the engineer. The developer’s worldview was controlled by a profit-motive, whereas Alex’s worldview was driven by environmental concerns.

Thus, I think it is reasonable to consider this case as a successful instance of frame-shifting as Zarefsky proposed by which deep disagreement was overcome. Deep disagreement does not always result in complete intractability. We should note a few points about the moves that enabled this to occur:

- (1) The moves that expanded that common ground and focused the question to something workable were rhetorical moves that allowed for a set of framework propositions that could include environmental benefit.
- (2) The exordium made use of the language of the client to create good will, allowing a subtle shifting of frames rather than a confrontation.
- (3) The rhetorical move appealed to emotion. This is not, of course the same thing as being emotional—Alex was careful to control his own passions throughout, even when his supervisor undermined part of the plan. The appeal was to friendliness, so that the client would judge the ideas from the same side as Alex, thus be more likely to accept the ideas. This move does not pre-empt reason, but as Aristotle noted it did impact what seemed important.
- (4) The differing worldviews were never explicitly raised. The critical worldview clash was kept beneath the surface. This move prevented the possibility of emotional flooding or engaging defensive strategies.
- (5) Alex stopped pushing—or rather was stopped by his supervisor—at the point where they had reached as far with the client as was possible. Indeed, Alex’s final move threatened the compromise position as the client pushed back against Alex’s credibility. Note that it was the supervisor’s rhetorical savvy that determined what was as far as possible. That boundary is ill-defined, but the supervisor resisted pushing up against the boundary so as to avoid invoking defensive mechanisms from the client.
- (6) The key argumentative move involved what Zarefsky called “packaging” wherein the two discrete interests are subsumed under one shared interest. However, the client did not have any interest in environmental design, until the frame of his concern was shifted by Alex’s “savings.” In fact, he would not acquire more profit. The units would not recoup the expense of the initiatives. However, the client was still persuaded that the green image he was seeking would “pay off” in some less tangible sense.

Thus, the deep disagreement was successfully circumvented. For both parties, the agreement was a compromise—Alex had wanted the blind control; the developer had not wanted to spend any money. In argument, such compromise is usually understood as a logical and reasoned outcome—the trade-offs between environmental responsibility are weighed against the requirement of profitability. So, from these points of intersection, Alex was able to educate the developer in terms of the value of using environmental ma-

terials and solar heating. As they moved in this common direction, building on their disparate expertise, they were able to reason together effectively.

7. CONCLUSION

The cases I have examined here show the challenges of voicing worldview-based disagreements in an engineering context. The majority of engineers I have surveyed have indicated that their experience of vocalizing disagreements has been positive and well-received. One respondent did note that such confrontations seem to have “a slightly polarizing influence between those who get it, and those that don't, and don't want to.” Note the respondent’s awareness of a worldview behind the resistance. The issue is not simply not “getting it”, but not wanting to (pigheadedness). The respondent’s view may show an awareness that he has brushed up against positions for which argumentation may be useless—the intractable quarrel. All respondents noted that they would pick and choose whether to raise objections depending on the circumstance. This, at least, shows an awareness of the limits of argument (and rhetoric).

As Campolo and Turner note, “It turns out that we have a sort of competence in picking an effective strategy for getting back on track” (2002: 4). Certainly, the subjects in my study have demonstrated an awareness that not all disagreements should or could be ‘reasoned.’ This seems to bode well for rational argumentation. However, what is more significant is that some of them, like Alex, are not just seeing the limits of argument—of reasoning together—but seeing the potentials of persuasive rhetorical moves to begin to build bridges across the deep disagreements between a new environmentalist engineering worldview and a more traditional engineering worldview. As they build these bridges, they are able to shift the frame of the argument to one that at least begins to incorporate the environment as a stakeholder.

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Commentary on “DEEPENING DISAGREEMENT IN ENGINEERING EDUCATION” by Robert Irish

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Professor Irish argues that disagreements between recently educated engineers and employers arise due to a clash of conflicting worldviews, and that one step towards resolution involves the use of emotions and rhetoric rather than argumentation. There are several constructive criticisms I would like to make regarding Professor Irish’s paper. First, it is not made clear what is meant by “worldview” since there is an equivocation on this term in the course of the paper. Second, it is not obvious that clashes between employer and engineer need to be a clash of worldviews, but rather they may boil down to a disagreement in particular beliefs perhaps even in the context of a shared worldview. This is the most parsimonious explanation of disagreements in engineering or other contexts. Third, there is no reason to assume that an appeal to emotion or rhetoric is non-rational or non-argumentative. Arguments can involve all sorts of premises, whether factual, statistical, evaluative or emotion-based. Finally, there is the ethical issue of whether one ought to engage in a so-called shift of worldviews to resolve a disagreement as this may involve a sleight of hand or parlor trick, thereby violating the autonomy of the listener. Further, honesty about one’s beliefs is an important ingredient of good arguments.

First, there is no unequivocal non-vague definition offered of the concept of “worldview,” and therefore it is not clear what is meant by a clash of worldviews. The author appeals to several different accounts of worldviews such as “ways of seeing things” (Wittgenstein) or “stories” (Wright) or “ways of being in the world.” (Wright). All of these definitions are very different and rather vague and general, nor are they sufficiently elucidated or shown to be consistent with one another to be able to provide an account of what it means for X and Y to have a clash of distinct “worldviews.” Professor Irish seems to assume that this is an evolution of the concept “worldview” but there is no reason to think that these various authors are talking about the same thing.

Second, there is no reason to assume that when X and Y disagree about whether environmental concerns are more important than economic/financial concerns that there is a clash of worldviews. X and Y may simply differ on this one belief – that environmental concerns are more important than economic concerns - and yet agree on almost everything else. If they are both working for a company whose motive is profit, then supposedly they both agree that capitalism is an acceptable economic system. They may not share peripheral beliefs in common, but from this it does not follow that they adhere to fundamentally different or inconsistent worldviews. This more parsimonious construal of disagreement does not bring with it the cumbersome machinery of “worldview.” In the field of ethics, Stevenson has already provided an account of “disagreements in attitudes” which can be resolved by rhetorical means, and so there is a sense in which Professor Irish is re-inventing the wheel. Further, what Irish calls a disagreement in worldviews

may in some cases be what Copi calls a verbal dispute that is a definitional rather than a substantive disagreement.

Third, and this may merely be a verbal disagreement on my part, there is no good reason to call the use of emotion and rhetoric non-argumentative or non-rational. Consider Aristotle's practical syllogism from the *Nicomachean Ethics*:

S wants Y. S believes that by doing X, Y will eventuate. Thus, S does X.

This practical syllogism is an argument whose conclusion is an action and one of whose premises appeals to emotion. Further, an appeal to pity in order to persuade someone to give to charity is an argument, but an argument that appeals to emotion. The reasoning given for a claim in such cases is emotion-based, but it is still reasoning nonetheless. However, the question is whether appeals to emotion are ethical. If you convince someone to give to charity by appealing to their emotions, then this could be construed as unethical.

The above consideration leads to my final criticism of Professor Irish's approach to resolving disputes. If the young engineer persuades their employer to accept their claim that the environment is more important than profit by appealing to the employer's emotions or by some other sleight of hand such as shifting worldviews unbeknownst to the listener, this violates the autonomy of the listener by not respecting their ability to come to terms with the claim being argued for. Further, if the arguer is engaging in a paradigm shift simply to win a dispute, this indicates a lack of honesty on the part of the arguer. If the young engineer is truly committed to their beliefs, then perhaps they should consider working for another company as is the case with Grace.

Reply to Brian MacPherson

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Brian MacPherson raises four objections to my paper. I will respond to each in turn.

1. THE TERM “WORLDVIEW” IS VAGUE

Admittedly, the term worldview does have a degree of vagueness, in part because it is an encompassing term. Indeed, the term has moved in meaning since first introduced by Kant. I have attempted to clarify my use of the term in section 2 of the present paper. I trust readers of the paper will find the term productive as defined there. It is certainly less vague than Fogelin’s “forms of life,” so the move is toward clarity.

2. WORLDVIEW IS UNNECESSARY “CUMBERSOME MACHINERY”

Dr. MacPherson finds no reason to see worldviews in conflict just because X and Y disagree about the environment. To the contrary, such disagreements *must be* grounded in differing worldviews. Consider the example of whether a wetland should be drained for development. If the environment should be protected from degradation, then the demand to drain a wetland conflicts with that value. Leaving worldview out of such a discussion misses the more systemic questions of why the disagreement occurs and remains intractable. Such questions and possible answers are enriched by understanding the place and role of worldview in our reasoning. On this point, I am trying to advance Fogelin who understood such disagreements to derive from “systems of framework propositions.”

3. EMOTION AND RHETORIC SHOULD NOT BE LABELLED NON-ARGUMENTATIVE OR NON-RATIONAL

I agree that the distinction between rational and rhetorical is overstated; it derived from Fogelin. For the purpose of this paper I accepted it. In the version that appears here, I have downplayed that distinction though not entirely addressed it.

4. SHIFTING FRAMES COULD VIOLATE “THE AUTONOMY OF THE LISTENER”

I have begun to address the last criticism at the end of section 6.1; however, more can be said. Perhaps, Dr. MacPherson holds a higher view of human rationality than I do, but the cases that I have examined suggest that people’s ability to “come to terms” is often constrained by prior bias. Thus, in a dispute, making rhetorical moves that pre-empt the interlocutor’s bias is reasonable. They are not “sleights of hand” but strategic positioning as

happens in any logical dispute. To see these as “violating the autonomy” of the interlocutor would render most debate impossible.

5. CONCLUDING THOUGHTS

Finally, Dr. MacPherson suggests that “If the young engineer is truly committed to their beliefs, then perhaps they should consider working for another company as is the case with Grace.” However, this suggestion would leave companies stagnant and excellent, engaged young engineers out of work. Grace, after all, did not move to another company; she retreated to the relative safety of more school. As such, her case cannot be regarded as a successful upholding of beliefs in the face of opposition, and her company can carry on without making the move to a more environmentally considerate development firm.