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# What is gained by articulating non-canonical engineering ethics canons?

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# What is gained by articulating non-canonical engineering ethics canons?


## Abstract

As organizers of the special session on non-canonical canons in engineering ethics, we explore in this paper the processes by which professional societies develop Codes of Ethics, and how institutional power shapes both processes and outcomes. In analyzing specific episodes of canon formation, such as the process that resulted in the omission of sustainability from the ASEE Code of Ethics (despite a separate ASEE board statement on sustainable development in 1999), and the process that resulted in the recent addition of sexual orientation, gender identity, and gender expression in the IEEE Code of Ethics, we hope to reveal the ways in which ethical work in engineering (as in other settings) is always preceded by demarcation of boundaries. Who counts as a moral agent? Who is subject to the code? Does the code imply collective as well as individual responsibility? Who has standing to raise concerns? Who has clout to shape the code?

Moving from analysis to action, this paper explores what it means to create an alternative, a "shadow code" that lives outside the canonical articulation of engineering ethics by professional societies. Such an alternative or non-canonical list might directly reframe existing priorities (say, inserting health or sustainability concerns across a wide range of ethical instructions for engineers) or introduce entirely new, previously unspeakable priorities (say, the notion that in any given case of engineering practice, the most ethical action may be to choose not to undertake an engineering project in that time or place).

While we might count it a victory for some of the non-canonical canons to move, in time, into the accepted professional society codes, that is the not the primary purpose of creating this alternative stream of ideals in engineering ethics. Rather we hope to illuminate the political nature of the process, the ways insider-outsider dynamics play out in professional societies, and the contestation of what counts and does not count as engineering.


## Introduction

What are the processes by which professional societies develop Codes of Ethics, and how does institutional power shape both processes and outcomes? Who counts as a moral agent? Who is subject to the code? Does the existence of a code imply collective as well as individual responsibility? Who has standing to raise concerns? Who has clout to shape the code? We seek to explore these questions first through analysis of the historical emergence of ethics codes in the context of the use of written instruments in general in engineering. Then, in analyzing three specific episodes of canon formation in engineering professional societies, we hope to reveal the ways in which ethical work in engineering (as in other settings) is always preceded by demarcation of boundaries.

The first case study concerns the process that resulted in the omission of sustainability from the ASEE Code of Ethics (despite a separate ASEE board statement on sustainable development in 1999). The second case study examines the structure and function of ethics codes within the IEEE, including the proliferation of ethics codes among IEEE subgroups, revisions or omissions of the paramountcy clause in the codes, and the IEEE prohibition against its own Ethics and Member Conduct Committee from giving advice to individuals, despite the IEEE Code of Ethics requiring members to assist one another in compliance with the code. The third case study considers the process that resulted in the recent addition of sexual orientation, gender identity, and gender expression in the IEEE Code of Ethics.

Moving from analysis to action, this paper then explores what it means to create an alternative, a "shadow code" that lives outside the canonical articulation of engineering ethics by professional societies. Such an alternative or non-canonical list might directly reframe existing priorities or introduce entirely new, previously unspeakable priorities (say, the notion that in any given case of engineering practice, the most ethical action may be to choose not to undertake an engineering project in that time or place).

While we might count it a victory for some of the non-canonical canons to move, in time, into the accepted professional society codes, that is the not the primary purpose of creating this alternative stream of ideals in engineering ethics. Were that to be our primary purpose, we would thereby moot the possibility of acknowledging our own, or others' engineering expertise as insufficient to a given cause; that is a possibility we fervently hope to maintain. Rather we hope to illuminate the political nature of the process, the ways in which insider-outsider dynamics play out in professional societies, and the contestation of what counts and does not count as engineering.

## Roles of Ethics Codes in Profession and Society

We begin by laying out some ways in which engineering codes of ethics have traditionally reflected the social influence held by both engineers and their audiences. This involves identifying the priorities explicitly expressed in ethical standards regarding, say, contributions of engineering to human health and welfare, economic prosperity, national security, or environmental sustainability, as well as understanding for whom these priorities may be advantageous. However, it also involves identifying a wider array of interests both social and professional: the shared visions of engineers and others concerned to preserve boundaries around bodies of technical expertise and to protect social structures more broadly. We see engineering codes of ethics as directed at the control of technical and social conditions, and those two desired ethical effects as profoundly interconnected in the conduct of engineering work.

Historically, American engineering organizations began in the mid-nineteenth century not around collective behavioral commitments but as a means of exchanging knowledge. As Michael Davis[1] outlines, it was not until around 1910 that professional societies turned in significant numbers to the codification of best practices and ethical priorities. That burst of ethics-writing activity was followed by others through the twentieth century, Davis explains, usually instigated by moments of great growth in the profession or of notable outside pressures for self-regulation.[1,2] Codes of ethics have customarily mandated rigorous, honest, and disinterested engineering practice and depending on the sub-field, also more specific instructions regarding pertinent materials, technical processes, and commercial relations. These instruments are essentially optimistic in projecting a desired future: Responsibility is distributed in expectation of engineering missteps, but the profession's belief in the possibility of good outcomes is above all confirmed.

Superficially, codes of ethics appear to represent expressions of shared values, the traces of consensus having occurred at some juncture about what will count as desirable occupational conduct. Clearly, engineering disciplines that produce such codes see neither the handling of materials, machines, infrastructures and landscapes by their members -- nor their fields' preferred means of dealing with patrons, the public, and labor forces -- as sufficiently controlled either through training or by means of some unspoken consensus among practitioners. The existence of formal codes of ethics tells us that some written, distributable articulation of such priorities is also felt to be required. But if we are interested in the social relations associated with engineering codes of ethics, we must ask: Why precisely is such an articulation felt to be necessary? After all, many features of many professional operations never find such formal expression; although Codes of Ethics for History professors exist, they are rarely invoked in practice or passed along for graduate students, for example. Moreover, although developing a code of ethics is commonly viewed as having been an essential part of engineering's professionalization in the United States,[1] the question of how codes of ethics actually shape daily engineering practice is a, huge realm for study. To delve into this issue, we can consider how the actors who have produced and endorsed engineering codes of ethics may have seen their enterprise as a social one.

The existence of any regulatory instrument, whether we refer to laws, standards, policy documents or codes of conduct, implies that its authors perceive a risk of transgression. When engineering societies produce codes of ethics, how great a risk of transgression do they perceive? Who is assessing this risk, and is it seen to differ for different persons who are subject to the code…say, for the neophyte vs. the senior practitioner? Who counts among the morally dependable and who among the fallen or suspect? As Pfatteicher makes clear, codes of ethics operate on the presumption that knowledgeable, meritorious individuals will demonstrate obeisance to collective sensibilities. This prompts us to explore how types of individuals (wise, scrupulous…inept, unscrupulous) may also be distinguished by engineering codes of ethics; and in fact, such types brought into being. The universalizing tone of ethical prescriptions notwithstanding, codes of ethics operate from specific presumptions about who may reasonably be expected to take responsibility for what activities. For this reason, a code of ethics can provide a lens on experts' ideas of the privileged role of expertise in society.

Let's first consider how codes of ethics enact delineations among those operating within a technical sector. It is precisely the universalizing tone of codes of ethics that may bring about these demarcations of worthy practitioner from unworthy. As Slaton[3] describes, materials standards and specifications surrounding materials testing after 1900 indirectly denigrated the technical capacities of traditional artisans in American building trades; these written instruments did not say explicitly that such artisans were incapable of any particular activity, but conveyed through their selection of optimized practices that only the activities of degree holding engineers could constitute reliable practice. Similarly, engineering codes of ethics connote that only those associated with their use have the potential for proper technical conduct. In the normal conduct of engineering business, nobody would expect that a mechanic would or could comply with the codes of ethics devised by mechanical engineers. Actual knowledge, experience and morality notwithstanding, the mechanic's conduct cannot be assessed by metrics applied to that of the mechanical engineer due to particular standards arising from the engineer's specialized knowledge. The professional code of ethics ontologically produces the field for which it dictates behavior. In other words, the conduct/misconduct binary superficially implied by a code of ethics is not the telling social distinction here.

This recontextualization helps us see the ways that codes of ethics may have still wider social effect; i.e., it is not only those directly subject to engineering codes of ethics whose social position may be delineated therein. For example, in historical eras when women and persons of color were considered as entire classes of persons too mentally and physically feeble to become engineers, professional codes of ethics, in ascribing the potential of engineers to secure health and safety in the modern city or factory, helped to reinscribe white, male control of human welfare in those settings. Certainly the distributions of benefit and risk accomplished by engineering codes of ethics include those most obviously directly related to the products of engineering (that is, matters of who is to be made safe, and how safe, in the prosecution of engineering's ends; or who is to profit, and by how much) but as we discuss below, these distributions occur on multiple levels supported by the codes. Because engineering knowledge and practice derives from within a larger system of social and political privilege, we see the delineations of "good engineering conduct" accomplished by codes as inseparable from such distributions of benefit and risk across society.

To understand that inseparability, we would first note that while engineers' codes of ethics function to demarcate professional engineering from other technical practices and eligible aspirants from ineligible, they have a third and somewhat asymmetrical social function in aligning engineering with other elite groups in society. Formal ethical commitments, whatever their content or level of enforcement, associate their proponents with efforts at self-discipline and self-surveillance.[2] Older professional narratives in the history of engineering[4,5] capture well the ways in which American engineers sought similar cultural standing to that of scientists or physicians in the early twentieth century. While those narratives only intermittently engage with issues of identity and power in explaining the growth of professional engineering, they help us see that for professional groups, codifying best ethical practices can support broad social flows of privilege.[2,6]

Departing from those histories to a degree, we want to emphasize here that so-called technical and social/professional risks addressed by engineering codes of ethics are inseparable from one another. The political origins and impacts of these codes are inexplicable without a sense of that inseparability. We stress as well that customary distinctions of these types of risks from one another may mislead in an analysis of engineering's societal role. The technical aspects of engineers' intellectual engagements (say, with the strength of concrete, the force of flowing water, the speed of moving bullets or data) are understood by engineers to be prone to misapprehension and mishandling, and to dangerous or fraudulent manipulation. These vulnerabilities in turn imply the necessity for control, through both the dictation of practice and workable limits regarding who may practice; this is why discrete occupational groups produce their own codes of ethics, after all, and do not rely on some general moral code applicable across every member of society. But if we want to fully understand the role of engineering in society, we must also recognize that that which *appears to require control* derives from notions of elite status on the part of code proponents.

This is an ontological perspective that somewhat counters Michael Davis' description of engineering ethics as representing a moment in which "knowledge moves to action."[1] We would instead say, following Dewey[7] and in hopes of articulating even more aspects of engineering activity, that knowledge is doing.[8,9] This view opens the way to seeing how codified best practices foreclose alternative practices, not by behavioral dictate but ontologically. For example, the notion of there existing safely and unsafely designed bridges, as conveyed in a code of ethics, implicates any individual bridge as a necessary undertaking to the engineer abiding by that code. The presence of no bridge, no dam, no human-made structure, become impossible. At the very least those alternatives are rendered ethically inconceivable, but we would venture further that they render actual entities (pernicious dams and virtuous free flowing rivers) nonexistent. That these alternative approaches strike our ears as absurd make it all the more urgent to ask how codes of ethics urge forward only certain social relations. Even more vexing perhaps is the idea that engineering *produces* the material conditions it treats as prior to its interventions, and that these productions also represent possibilities rather than empirical certainties.[10] Law and Lien[10] describe this approach to understanding human engagements with materials as, "looking at what objects come to *be* in a relational, multiple, fluid, and more or less unordered and indeterminate (set of) specific and provisional practices" (366).

Pfatteicher[2] offers a compelling portrayal of ASCE ethical efforts as shifting from "descriptive" statements of members' special abilities and knowledge in the early nineteenth century to "prescriptive" codes in the early twentieth. While her historical actors clearly understood their efforts along these lines, we want to suggest that from another perspective the division between descriptive and prescriptive efforts may be somewhat blurrier. Responsible dam engineers would no doubt heed the ethical mandate for public safety, health and welfare, which mandate presupposes the possible co-existence of dam and safe public. Any dam is projected as coming about either through safe or unsafe engineering practices, and in a non-trivial sense this is precisely how dams come to be. Yet, consider that *both* the safe and the unsafe dam exclude the freely flowing river from reasonable existence. That engineering codes of ethics have never, to our knowledge, included instructions to "reflect on who benefits from this code of ethics and what they might be leaving out of their ethical reasoning" makes our point even more strongly. That is, in any optimized engineering activity, be it design, measurement, or ethical self-scrutiny, "relations are being done" (366). By extension, other relations might be done instead, and some of those other relations are ones we hope to promote.

## Case Study: Excluding Sustainability from the ASEE Code of Ethics

In 2011 the ASEE Board of Directors asked the Engineering Ethics Division to draft a Code of Ethics for ASEE for consideration for adoption by the Board. The Division formed a committee (of which one of the present authors was a member). The committee chair presented a report and the draft code to the Board in early 2012. The Board was generally satisfied with the draft and expressed only three concerns, the most contentious of which involved the proposed third provision "Encourage students to comply with the principles of sustainable development." The Board's concern was described by the committee chair to the committee membership as follows: "They [the ASEE Board] felt that the phrase 'sustainable development' was poorly defined and that some members (say, in petroleum engineering) would feel that the very nature of their work was unsustainable."

Some committee members found this to be an odd objection given that sustainable development has been incorporated in many engineering codes of ethics (most notably that of the ASCE) and the principles of sustainable development have been endorsed by many engineering societies including the ASEE which had (and still has) a Statement on Sustainable Development Education first issued in 1999.[11]

Nevertheless, after much discussion the committee agreed to drop sustainable development from the draft and substitute the provision "Encourage students to be aware of the environmental and social impact of their solutions." This change passed muster and the Code was adopted by the Board. Since many advocates of sustainable development talk in terms of three pillars of sustainability (social, environmental, economic) it might appear that the alternative wording achieved the same effect as the proposed wording. But by arbitrarily excluding the concept of sustainable development from the Code, the ASEE Board took a step backwards in the evolution of contemporary engineering codes of ethics and missed an opportunity to underscore its leadership role in the area of sustainable development that dates to 1999. Indeed, The Code is currently listed as only one of four "ASEE Board of Directors Statements" along with statements on Engineering Ethics Education, Diversity, and the aforementioned Statement on Sustainable Development Education.

The removal of sustainable development from the code may seem like a mere matter of bureaucratic consensus, with all the original potential for student engagements with sustainability preserved in the final wording. After all, "environmental and social impact" can be seen as an umbrella term under which "sustainability" fits. The "poorly defined" original term didn't give way to one of greater precision, certainly, but in their looseness the terms might reasonably be seen as pedagogically equivalent. But with an eye towards its formative history, we find that the final wording of the Code represents not an incidental vagueness or adherence to value-neutral aims, but what might best (if somewhat clumsily) be labeled an "interested consensus." Rather than evacuating the interests of stakeholders, such collective efforts accommodate all involved. In the wording here, this accommodation occurs precisely because "student awareness" is a notably blunt critical instrument next to the acts of comparison or measurement, as would be constituted by students' consideration of a relative quality such as sustainability. But sustainability is not a quality that is extant in the world projected by this code; "impacts" seem to exist, but of what kind? What categories of material displacements or environmental consequences may possibly derive from the activities of engineering? What should we look for as we function ethically in the environment? We would not know or guess from this provision as written, as seems to have been at least an indirect intention of the Board of Directors' insistence on removing "the principles of sustainable development" from the code.

## Case Study: IEEE Codes and Practices in Organizational Context

The IEEE enjoys a higher profile in engineering ethics discussions than most engineering societies due a few actions that have garnered enduring notice in the engineering ethics literature (as far back as an Amicus Curiae brief filed by IEEE in the BART case in 1975).[12] The actual history, however, has been more nuanced with IEEE's positions ranging from progressive to reactionary. IEEE was formed in 1963 by a merger of the American Institute of Electrical

Engineers (AIEE) and the Institute of Radio Engineers. Although AIEE had one of the earliest codes of engineering ethics (1912) this code was unknown to the IEEE Committee charged with formulating a code in the 1970s.[13]

The current IEEE Code was first adopted in 1990[14] although it has been amended several times, the most controversial of which is discussed in the next section of this paper. In this section we briefly summarize some of the novel or more controversial provisions of the IEEE Code.

The first provision of the IEEE Code uses different wording than that found in most modern engineering codes of ethics. The common wording, which has become known as the "paramountcy" clause, pledges engineers to "hold paramount the safety, health and welfare of the public." The IEEE version reads: "to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment." It has been rumored that the hedged wording, "consistent with," in the first part of the IEEE version was to avoid offending the thousands of IEEE members who work in the defense industry (perhaps in the same vein that the ASEE Board did not wish to offend petroleum engineers by invoking "sustainable development"...another moment of interested consensus). On the other hand, the phrase "to accept responsibility" may be interpreted as a strengthening of the paramountcy clause. Moreover, the mention of the environment in the provision's second part is the first instance we know of where a major engineering ethics code addressed the environment.

The fifth provision of the IEEE Code is somewhat unique among engineering ethics codes in that it requires IEEE members "to improve the understanding of technology; its appropriate application, and potential consequences;" in contrast most such provisions in other codes focus on public understanding and appreciation of engineering.[15]

The ninth provision of the code, "to avoid injuring others, their property, reputation, or employment by false or malicious action," is a controversial provision due to its potential for stifling internal dissent. Indeed, it appears this provision was specifically enacted to censure an IEEE member who was very critical of the Board and certain Board members.[16]

The tenth and last provision, "to assist colleagues and co-workers in their professional development and to support them in following this code of ethics" is notable for its endorsement of "ethics support" but even more notable given IEEE's prohibition against members of the organization's Ethics and Member Conduct Committee (EMCC) from abiding by the provision. IEEE By-Law I-305 states that: "Neither the Ethics and Member Conduct Committee nor any of its members shall solicit or otherwise invite complaints, nor shall they provide advice to individuals." To our knowledge IEEE is the only professional engineering society that prohibits members of its ethics committee from from adhering to a requirement in its Code of Ethics, much less a requirement that all IEEE members "support" colleagues "in following this code of ethics." (For a detailed discussion of the events that led to the restriction on advice to individuals, see Stephen Unger's essay on the topic.[17])

Ironically, in a Policy Statement adopted in 2004, IEEE appears to endorse EMCC support of individuals in upholding the Code:

> The EMCC emphasizes that IEEE is committed to being supportive of any member who acts to uphold the IEEE Code of Ethics. It recognizes that voicing concern about ethical violations could jeopardize a member's career opportunities. Nevertheless, the EMCC believes that by raising awareness of IEEE's strong stance on ethical conduct through this Position Paper, its members in industry, academia and elsewhere will be helped to carry out their professional responsibilities in a manner consistent with the highest traditions of IEEE.[18]

As if the inconsistencies in the official IEEE Code of Ethics and policies aren't enough, the organization has experienced a proliferation of codes in recent years beginning with the Software Engineering Code of Ethics and Professional Practice promulgated by the Association for Computing Machinery and IEEE Computer Society in 1999, the Code of Ethics of the IEEE Engineering in Medicine & Biology (EMB) Society (undated), and the 2014 IEEE Code of Conduct (which according to an IEEE staff member has nothing to do with the Code of Ethics and the EMCC ). Many inconsistencies exist among these codes; for example the EMB code does not include a paramountcy clause.

**Case Study: Amending the IEEE Code for Inclusion**

If many of the contested moments in Code development and inconsistencies among engineering sub-fields' behavioral prescriptions derive from conflicts in the professional sphere, we err if we see these spheres as firewalled from society writ large. This is made especially clear when we begin to look for the role played by identity categories in engineering Codes of Ethics: those differentiations of race, ethnicity, age, gender, sexuality, religion, or mental and bodily ability that have historically served to distribute privilege in the United States. In both their content and their reception, diversity tenets in engineering codes reveal the integrated character of engineering and society; this is not a figure/ground relationship, but one of profound inseparability. Similarly, we begin to see that attention to behavioral choices as such may be variously cast as salutary for engineering as a sector of society (as has traditionally justified the production of ethical codes), or disruptive (where it is cast as inappropriately concerned with politics).

IEEE's code of ethics is one of a few professional society codes that include specific reference to diversity: "to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin." Over the summer of 2013 the following change was proposed:[19]

> to treat fairly all persons **and to not engage in acts of discrimination based on** ~~regardless of such factors as~~ race, religion, gender, disability, age, ~~or~~ national origin, **or sexual orientation.**

The change would accomplish two things: add a prohibition against discrimination to general language about treating others fairly, and add the category sexual orientation as a non-discrimination category (already part of the codes of the Society of Petroleum Engineers and the International Society of Optics and Photonics).[15]

The proposed change was posted to IEEE's online forum for member feedback, where it was met with vitriolic opposition and moderate support. Objections fell into five general categories:

***Perception of Change as Political:*** Poster Barry Burgess put his opposition succinctly: "The proposed change is political, not ethical, and is inappropriate in IEEE's code of ethics." Brx was more accusatory: "It looks to me like there is a very vocal minority that wants to politicize and use every vehicle possible to validate its sexual preferences though they have absolutely nothing to do with excellence in Electrical and Electronics Engineering." And a poster going by the handle Professional Engineer took things a step further: "Officers and employees of the IEEE who are pushing the changes should be removed, and those seeking to use the IEEE for political purposes should forfeit their memberships." The boundaries being drawn here are quite clear: politics do not belong in the IEEE, and LGBTQ individuals are ontologically political. It is interesting that the latter two posters assumed the proposer(s) of the new language were LGBTQ (must be outsiders!), when in fact there was an organized response from the few out LGBTQ IEEE members to alter the proposed wording before adoption of the proposed changes, as the proposed language was not truly inclusive of the LGBTQ community.

***Sexual orientation is private/doesn't belong in the workplace***: A slightly different (though related) boundary was drawn between professional and private spheres when frequent commenter Luke Burgess (relation to Barry Burgess unknown) suggested that sexual orientation ought not to be listed because it has no place in a professional setting. "I for one, do not want to have anything to do with verifying an employe's [sic] `sexual orientation'." His use of scarequotes around the phrase suggests he does not believe this category is legitimate.

***Against listing categories, ridiculing sexual orientation:*** Jim Klessig commented: "It should end at `to treat fairly all persons.' If we are going to list various ways we can be unfair, why don't we pile on a few more? How about hair color, fashion sense, left / right handedness, obesity, anorexia, ability to dance, ability to whistle, singing ability." Another post discussed discrimination against "the post-term fetus". While the posters sought to make the addition of sexual orientation seem trivial and unnecessary, they did so at a time when Alan Turing, a pioneer in IEEE fields, was in the news over his impending pardon from the Queen of England. Turing committed suicide after having been chemically castrated by the state for being gay[20] (and this fact was known to the commenters, as Tim Wilson mentioned it in his post advocating adoption of the provision with expanded language to include gender identity/expression). The boundaries are being drawn here specifically to exclude LGBTQ people as a bridge too far, a category so ridiculous as to invite absurd comparisons. While Klessig apparently considers size discrimination also a bridge too far, it is being added to many non-discrimination policies,[21] and IEEE's own non-discrimination policy (separate from its Code of Ethics) prohibits discrimination on the basis of appearance.[22]

***Sexual orientation includes pedophilia, bestiality, and polygamy, which are immoral and illegal:*** Brx commented, "The real problem from a technical specification point of view, is that `sexual orientation' is far too broad a term...and some nations & local laws will practically REQUIRE discrimination of some forms of `sexual orientation', including but not limited to pedophilia, beastiality [sic], and polygamy." The notion of ethics code as technical spec illustrates the poster's take on the purported function and purpose of the codes in engineering: they require precision so as to be applied by trained professionals across a wide range of situations. Ironically, the poster ignores precision of language around sexual orientation while expecting fellow IEEE members to reject sexual orientation as imprecise: bestiality, pedophilia, and polygamy are not in fact protected by sexual orientation non-discrimination laws; sexual orientation is defined in federal law as “homosexuality, heterosexuality or bisexuality”.[23] Mistaken legal understanding aside, we are very interested in this poster’s invocation of “technical” epistemics, the understandings which specifications enact through their capture of best practices, routines, and the authority of their creators. Historians have shown that even the driest, most quantified technical specifications will nonetheless require subjective judgment in application, which suggests that specificity is by no means endemic to the “technical specification point of view” in any simple sense.[3] In addition, technical specs, like codes, imply the achievement of consensus around collective interests, interests which we have already shown in this paper to be far from universal in their positive societal effects. But this poster seems also to be using the idealized function of the technical protocol as a reason to step back from any analysis of fairness or power around sexuality. The social instrumentality of technical protocols is in all instance nearly impossible to talk about, since the primary aim of that which we call “technical” is to evacuate just such intentionalities, and we suggest that equating any societal aim with a “technical specification” (as this commentator does) forecloses both reflection and debate.

***Religion vs. Sexual Orientation:*** Posters with religious objections to LGBTQ people sought to argue that prohibitions on discrimination against sexual orientation were incompatible with prohibitions on discrimination on basis of religion. After quoting from the Qur’an and arguing that “almost every religion” has a prohibition against homosexuality, Luke Burgess asked “how can we square not engaging in acts of discrimination based on religion with not engaging in acts of discrimination based on sexual orientation?” Similarly Bill Brown said, “The root of the debate about `sexual orientation’ opposes my spiritual and moral beliefs.... If the class distinction of `sexual orientation’ is added to the code of ethics then that will create an ethical dilemma for me in which I will have to re-consider my continuation as a member of the IEEE.” While the use of scare quotes again suggests a lack of recognition of sexual orientation’s very existence, these posters seek to establish an engineering culture in which homophobic religious beliefs are protected along with their right to discriminate on the basis of those beliefs. Several posters raised concerns that they would be charged with discrimination on the basis of sexual orientation, and that this would constitute discrimination on the basis of religion. This fear suggests an understanding of the primary purpose of ethics codes as a means to include or exclude people, and in this case, for these posters, the populations of religious folks and LGBTQ folks are mutually exclusive.

The decision of the IEEE Board of Directors ultimately did not reinforce the boundaries to which these posters appealed. Even though there are very real and clear dividing lines between political and apolitical, and between private and professional, this did not result in an “interested consensus” that met in the middle with, for example, vague anti-discrimination language that refused to name categories. Not only did the proposed change prevail, but also the Board of Directors adopted the suggested language from the LGBTQ community to include not only sexual orientation but also gender identity and expression.[24] What is different about this case?

***Committed and Organized Leaders.*** First, two transgender women, Lynn Conway and Leandra Vicci, organized influential actors to engage in the process.[25] Conway is particularly well known as an IEEE Life Fellow, National Academy of Engineering (NAE) Member, and mother of Very Large Scale Integration (VLSI) circuitry found in almost any electronic gadget today. Vicci is also well established in IEEE as a Life Senior Member, known for inventing Salphasic Clock distribution used in globally synchronous systems. Together they invited influential cosigners including "the President of Stanford University, Presidents Emeriti of M.I.T and Caltech, numerous Members of the National Academy of Engineering (including a past President of the NAE) and numerous widely respected IEEE Fellows."[26]

The letter itself presented the change as incremental (if that) - it did not move beyond existing IEEE policy, and merely extended its principle of inclusion to one more group, in order to bring the Ethics Code into consistency with IEEE's own Nondiscrimination Policy, which prohibits discrimination based on "sexual or affectional orientation" or "gender identity." Taken together, a mildly presented letter signed by numerous influential insiders and leaders of the IEEE and the broader engineering community, most of whom are straight, cisgender allies, all served to neutralize perceptions that this move was in any way political, or personal to its proponents, in nature. Rather, they were able to present an interested consensus in favor of the change.

This is not to minimize the significance of this change; IEEE is the first engineering professional society to place non-discrimination on the basis of gender identity and expression into its Code of Ethics, and among the first adding sexual orientation. The success of this particular strategy, presenting historic change as correcting an inconsistency within IEEE, supported by prominent insiders, reveals much about how IEEE and other engineering professional societies work, and how their ethics codes function.

One ought not to discount sweeping civil rights advancements for LGBTQ people in the United States as a factor in the IEEE's new commitment; this move would have been inconceivable only a few years ago. Changes in public opinion, state laws, and university and industry policies (including the IEEE's own non-discrimination policy) have made it relatively safe for these influential individuals to step out and sign a letter like the one Conway and Vicci wrote. Professional norms have in some ways already changed because the institutional settings in which most members work have changed.

However, the changes in workplace non-discrimination are themselves limited and limiting. Notions of justice that might require the queering of curricula, engineering epistemology, or workplace cultures are laid aside in favor of a narrow ideal of diversity in which a collection of individuals co-exist in harmony.[27] Non-discrimination, while a vital employment protection, does not fundamentally change straight-queer or cis-trans power relations in the workplace. An ethics code that did do that (see, e.g., Riley and Lambrinidou's proposed language in another paper in this session that "Engineers shall act to resist hegemonic power and systems of oppression...") would be unlikely to succeed in committee (and unlikely to win favor among many of the influential insiders who happily signed on for non-discrimination). It risks too much. It might call into question the complicity of the engineering profession in such systems of power.

**Discussion: From Analysis to Action**

The special session of which this paper is a part explores what it might mean to create an alternative code of ethics, a "shadow code" that lives outside the canonical articulation of engineering ethics by professional societies. Such an alternative or non-canonical list might serve as a clearinghouse for attempts to reframe existing priorities or to introduce new ones that would never make it through a committee. In a sense, we imagine a subversion of prevailing channels of interested consensus formation. For example, what if sustainability concerns were infused across a wide range of ethical instructions for engineers, rather than existing as an add-on (if that)? What if the paramountcy clause were re-invoked in canons addressing loyalty to clients and employers? What if principles like peace, racial equity, or ending poverty were adopted as core engineering ethics ideals?

Again, we ask these "what if" questions in part because we would like to see these non-canonical canons to be accepted in professional society codes, but we do not expect to achieve the adoption of this this alternative stream of ideals in engineering ethics any time soon. Our more immediate goal is to reveal the political nature of the process, the ways insider-outsider dynamics play out in developing interested consensus in professional societies, and the boundary work contesting what counts and does not count as engineering.

Engineers are often conflict avoidant and may seek to quell any such contestation. It may be helpful to remember that ethics codes are hotly contested in other professional societies. For example, Architects/Designers/Planners for Social Responsiblity (ADPSR.org) recently campaigned (unsuccessfully) to change the American Institute of Architects (AIA) Code of Ethics to state that "Members shall not design spaces intended for execution or for torture or other cruel, inhuman, or degrading treatment or punishment, including prolonged solitary confinement."[28] The proposal is based on AIA ethics principles around protecting human life and wellness.[29] The AIA refused to adopt this canon on the grounds that it would restrict members' practice, but the ADPSR's analysis[28] of the declination reveals much more about the organization's process. In particular they point out a glaring omission around architects' business priorities; while some AIA members expressed to ADPSR a concern that such a restriction would hurt their business interests and that they did, in fact, value these over human rights, the letter does not make this prioritization explicit. Instead, legal concerns are foregrounded, particularly anti-trust concerns that an architect might sue AIA for restricting their ability to compete in the market.

Something similar may occur, if, for example, ASCE were petitioned to prohibit engineers' participation in water privatization projects, or ASME petitioned to prohibit weapons design. We would learn a lot about these societies and the profession through such proposals, and at the very least, begin a conversation about engineering ethics that would engage a greater portion of the membership than currently reflects on the ethics of their practice.

One might argue for what appears to be a more incremental approach, like that achieved by the IEEE success story involving the addition of sexual orientation and gender identity as categories for nondiscrimination. While this change is possibly worthwhile in laying groundwork for a larger effort, certifying for many audiences that this discrimination is a problem worthy of address from within engineering, it does not ultimately raise the structural and systemic questions about the role of ethics codes in professional societies, or the ways in which institutional power shapes processes and outcomes. Crucially, it does not widen the circle of moral actors who have standing to shape the code, so may not provide such groundwork at all. In fighting our image of engineering in society as figure on ground, we come to see that the flows of power and interest that serve engineering are those that serve other social sectors and without frank address of those conditions, "diversity" cannot lead to meaningful redistributions of power and privilege. Seen from that perspective, the IEEE's code change could simply in the end be propitiatory rather than transformative.

A shadow code presents a challenge to mainstream engineering ethics and may be in some places controversial. It may make some uncomfortable. It may draw out conflict by highlighting differences in perspective. It is helpful to remember that these differences already exist, and moving from latent to articulated dissent is healthy and constructive. The shadow code will never be adopted in whole, and that is not its purpose. Rather it may ultimately help to keep consensus moving in engineering societies. As counterintuitive as the goal of impermanent agreement may initially seem in the search for practical day-to-day guidance in our work, it is exactly this more ambitious, more reflexive prescriptive goal that will make our codes less static and more responsive to a broader audience.

## Conclusion

Engineering codes of ethics (like other organizations' codes, standards, and policies) have served to differentiate the profession and its members from others in society, and to correct for perceived potential transgressions that also mark insiders and outsiders. Canons reveal a set of relations taking place between those recognized as insiders and outsiders. Silences or omissions in the Code further reveal the possibilities of other relations, other recognized participants, and a different constellation of winners and losers, moral actors and those acted upon.

The processes that shape these codes are ones of interested consensus; the stakes presented are balanced to accommodate all at the table, so that *compliance* with *sustainable development* principles becomes *awareness* of *environmental and social impact*, and *holding paramount* the health, safety and welfare of the public becomes making decisions *consistent with* those aims. Only when a change can be viewed as occupying this space of interested consensus is it adoptable by a professional society, as in the case of adding gender identity and expression to the IEEE code.

The time has come to collect those canons that have not achieved interested consensus and to think deeply about why they have not. The time has come to imagine canons previously unthinkable because of the narrow and specific function of the codes for the profession and its organizations, because of who has been included in their formulation, and because of what has and has not been considered as engineering. Non-canonical canons can re-shape the range of moral actors and the moral range of action for engineering and society.

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