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Engineering Ethics in China: A Century of Discussion, Organization, and Codes

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Abstract: This article describes China's century-long concern with the professional ethics of engineers, especially a succession of codes of engineering ethics going back at least to 1933. This description is the result both of our own archival research and of "philosophical history," the application of concepts from the philosophy of professions to the facts historians (or we) have discovered. Engineers, historians, social scientists, and philosophers of technology, as well as students of professional ethics, should find this description interesting. It certainly provides a reason to wonder whether those who write about codes of professional ethics as if they were an Anglo-American export unlikely to put down roots elsewhere might have overlooked many early codes outside English-speaking countries. While code writers in China plainly learned from Western codes, the Chinese codes were not mere copies of their Western counterparts. Indeed, the Chinese codes sometimes differed inventively from Western codes in form (for example, being wholly positive) or content (for example, protecting local culture).

Key Words: codes of ethics, engineering, China, Chinese Institute of Engineers, profession

The common view today seems to be that codes of professional ethics in general, and codes of engineering ethics in particular, were until recently, say, the last three decades, a phenomenon largely confined to English-speaking countries. The very idea of professionalism is thought to be a recent export of the English-speaking countries.[1]

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This article should raise doubts about that view. It sketches China's century-long concern with the professional ethics of engineers, especially a succession of codes of engineering ethics going back at least to 1933. For convenience of exposition, we divide that century-long story into three periods: 1912 to 1933 (modernization), 1934 to 1948 (war), and 1949 to today (after the communist revolution). What makes this division convenient should become evident as we proceed.

Because we are both philosophers, not historians, we have done relatively little archival research for this article. We have instead written "philosophical history," that is, we have begun with what historians (and other social scientists) have discovered (along with common knowledge), rearranging those "facts" in ways our theory of professional ethics suggests until they told a story new in interesting ways (interesting to those who study professions). Though the test of a philosophical history is initially how convincing it is, the final test is the amount and quality of the research it generates. Even if the story turns out to be false, a philosophical history can be an important contribution to the study of history (as well as to other social sciences and philosophy).

The evidence we present in support of our story is therefore (more or less) limited by what historians have so far uncovered. That is a problem for at least two reasons. First, both the war with Japan and later upheavals damaged or destroyed many Chinese public libraries and private collections upon which we, or at least historians, might have drawn. Much of the history of the period may have been irretrievably lost. Second, even for the last few decades, the sources we might draw on are thin. Few historians who know the Chinese language, whether native speakers or not, have been much concerned with Chinese engineers even when they have been concerned with science and technology. Even fewer scholars writing in English have been. Insofar as scholars have written about Chinese engineering at all, they have generally treated it as continuous with older crafts.[2] They have not understood engineering as a modern *profession*, that is, as a number of individuals in the same occupation voluntarily organized to earn a living by openly serving a certain moral ideal in a morally permissible way (a discipline) beyond what law, market, morality, and public opinion would otherwise require.[3]

In this article, we understand the engineering profession to be a recent invention, distinguished in at least five ways from older crafts, trades, and manual arts producing similar artifacts. First, engineering is taught in universities or other institutions of higher education (such as polytechnics). Like scientists, engineers are typically "educated," not simply trained. Second, engineering is

generally taught in about the same way everywhere in the world, relying on a formal curriculum that seems to have begun taking shape in France in the late 1600s, changing only in detail as it spread and technology opened new fields. That curriculum includes chemistry, physics, drawing, and advanced mathematics, as well as a good deal of "engineering science" (statics, dynamics, thermodynamic, and so on).[4] Third, engineers are necessarily literate. They generate many documents, not only designs but also standards, test reports, operating manuals, descriptions of method, textbooks, and so on. Fourth, engineers share their discoveries both with other engineers and with the wider world. Unlike traditional crafts, there is no secret knowledge (except when law, employer, or client requires secrecy). Fifth, engineering knowledge is typically explicit. Of course, as in all disciplines, some knowledge is tacit. That is why experienced engineers treat graduates of engineering school as mere "engineers in training" for the first few years they are in practice. But there is a strong tendency among engineers to make explicit as much engineering knowledge as practical.

We also understand engineering to be distinct from "science," that is, from the pursuit of reliable knowledge about the natural or social world. The moral ideal that engineers serve is not knowledge as such but improvement of the material condition of humanity. For engineers, knowledge is not an end in itself but a mere means. In this respect, engineers resemble accountants, lawyers, nurses, and the like rather than scientists.

The First Period: Modernization, 1912–1933

After the Opium Wars (1839–1842 and 1856–1860) ended China's isolation from the West, more and more Chinese came to believe that far from being the center of the world's science, technology, and culture, China was far behind much of the world, especially Europe, the United States, and Japan. Many Chinese students traveled to those countries to study engineering and science (as well as other disciplines such as politics and medicine). Students returning to China from those countries helped to found technical or scientific societies. They also communicated technical information, for example, by publishing articles in Chinese engineering journals. Such activities may have helped to develop a sense of common purpose among engineers that became the basis for China's first code of engineering ethics.

For engineers in this early period, the leader was Zhan Tianyou, known as "the Father of China's Railroads."[5] In 1912, he founded the Institute of Zhong Hua Engineers in Guangzhou. This seems to have been the first engineering society in China. Elected its president in 1913, Zhan soon united the Institute

of Zhong Hua Engineers with two other engineering societies (the Gongji Society of Railroad Engineers and the Zhong Hua Engineering Institute) to form the Zhong Hua Engineers Society, moving the Society's office to Hankou city in Hubei province.[6] ("Zhong Hua" means China in a cultural or literary sense, as opposed to a geographical or political sense, much as "America" means the United States.)

The constitution of the Zhong Hua Engineer Society prescribed three missions for the Society:

> 1. Standardize project construction, draw up rules and regulations, and leave no margin for differences in engineering products.
>
> 2. Fully develop the engineering industry and use it to promote social well-being.
>
> 3. Update technology in the field of engineering, innovate new approaches, and don't be confined to conventions.[7]

The Society's three missions together underlined the importance to engineering of technical standards, public welfare ("social well-being"), and technological innovation.

This mission statement may be considered, if not the first code of engineering ethics in China, at least a proto-code, that is, a formal statement of ethical standards. Of course, "ethics" has at least three senses. It can refer, first, to ordinary morality (those standards of conduct that apply to all moral agents) or, second, to a field of philosophy (the attempt to understand morality as a reasonable undertaking). But, most relevant here, "ethics" can also refer to those morally binding standards of conduct that apply to members of a group simply because they are members of that group (for example, engineers or members of the Zhong Hua Engineer Society). It is in this third sense that the mission statement of the Zhong Hua Engineer Society may best be considered a code of ethics (or, given its brevity, a proto-code).[8] The statement sought to guide individual engineers, the members of the Society, as well as the Society itself, but not every moral agent—or even every Chinese moral agent. Engineers (non-Chinese as well as Chinese) might well consider it a statement of morally binding standards without being members of the Society.

About the same time that Zhan was founding the Zhong Hua Engineer Society, he was thinking more broadly about how engineers should act. For example, in a 1918 lecture, he called on engineers to develop in four areas: business, morality, rules, and relationships. He urged engineers "to promote invention on the basis of accurate scientific research," "to heighten morality by

respecting morally upright persons and acts," "to proceed in an orderly way and step by step, and not beyond what conditions allow," and "to plan in accurate detail and be more careful in their work."[9] In this way, Zhan sought to improve the moral sense, abilities, and conduct of the engineers of that time. As more engineers understood engineering ethics better, Zhan became a model for other engineers.[10]

Zhan died in 1919. After his death, the Zhong Hua Engineer Society grew slowly. But another engineering society, the Engineering Institution of China—founded in New York City in 1918—soon replaced it as the most important engineering society in China.[11] With more engineering students returning to China, the Institution also returned in 1920. Its journal, *Engineering*, was founded in 1923, eventually becoming a forum for discussion of ethical as well as technical matters. For example, one 1928 article argued that engineers should always study hard, be diligent, care about technology, and seek to improve the welfare of human beings.[12] Another, published the same year, claimed that "the missions of engineers" were two: first, to promote the happiness of life; second, to develop production, improve the daily life of people, and make them more comfortable. Engineers should be responsible for leading workers, should constantly exchange experience and knowledge with colleagues, and should honestly pursue common interests of engineers, even if that means sacrificing personal interests. Engineers should be loyal, honest in their work, and have "exalted minds."[13]

In 1931, the Institution joined with the Zhong Hua Engineer Society and other engineering societies to form the Chinese Institution of Engineers (CIE).[14] The CIE initially included fifteen engineering societies, the most prominent of which were the Chinese Engineering Society, the Chinese Institution of Civil Engineers, the Chinese Mechanical Engineering Society, and the Chinese Electrical Engineers Society. These fifteen societies became subdivisions of the CIE, but had their own rights. The CIE did its best to promote engineering. It connected engineers across China, sponsored speeches to tell the public about the significant roles of engineers, called for public emphasis on engineers, and set some industry standards. Chinese engineers thus achieved a unified professional society in 1931, something that American engineers have yet to achieve, though they have envied the unity of lawyers in the American Bar Association and of physicians in the American Medical Association for more than a century.

In 1932, the CIE held one of its annual meeting in Tianjin city. There Li Shutian, Wang Huatang, and others proposed establishing "the Engineering Code of Ethics Committee" to draft "an engineering code of ethics."[15] The

motion passed and Li Shutian, Hua Nangui, and Qiu Lingyun were appointed to the new committee. The committee soon proposed a code consisting of seven rules:

1. Be as loyal to the duty as a soldier to military service.[16]
2. Do not accept improper pay.
3. Do no harm, directly or indirectly, to the reputation or business of counterparts.
4. Internal strife with other engineers is absolutely prohibited.
5. Do not get business or position by dirty methods.
6. Do not arbitrarily comment on the work of colleagues in front of their employer.
7. Do not publicize in self-laudatory language or do anything to damage the dignity of the profession.[17]

This first proposal resembles the Code of Ethics of the American Society of Civil Engineers (ASCE) insofar as it is short, gives priority to "loyalty," and is most concerned with assuring good relations among engineers.[18] It is, however, not necessarily a good indication of what Chinese engineers at the time thought their ethics should be. CIE member Yun Zhen soon responded to this proposal with a shorter alternative having a somewhat different emphasis:

1. Be loyal to the profession.
2. Seek truth from facts.
3. Work hard and be able to endure hardship.
4. Neither accept nor give in an unfair way.
5. Collaborate with others, not jostle against one another or push somebody out.
6. Do not criticize others recklessly and exaggerate your own merits.[19]

The CIE discussed the two proposal, published them in *Engineering Weekly*, and mailed letters to members asking for comments.[20] After a year of discussion, the CIE (meeting in Wuhan city) let Hu Shuhua, Ling Hongxun, and Shao Yizhou modify their original proposal and adopted the resulting "Ethics Code of CIE."[21]

While apparently written after studying codes of engineering ethics from Western countries, especially the ASCE code, this early Chinese code was not a mere translation of any Western document. It was, in part at least, based on a

local understanding of what a code should be and what engineers should do. It consisted of six rules:

1. Don't abandon one's commitment or loyalty to duties.
2. Don't grant or accept rewards overstepping one's bounds.
3. Don't engage in internal strife or jostling against counterparts.
4. Don't harm, directly or indirectly, the reputation or business of counterparts.
5. Don't resort to despicable means to compete for business or position.
6. Don't engage in false speech or conduct that may damage one's professional reputation.[22]

The 1933 code is the first (full-scale) ethics code formally adopted by a Chinese engineering society. Though it resembles in length and form the ASCE code of 1914 more than any other major code of engineering ethics of the time, there are differences as well as similarities—as even this simple flow chart reveals (Figure 1, next page).[23] Note that the first, second, and sixth rules of the CIE code closely resemble in content the first, second, and sixth rules of the ASCE's code, while the third, fourth, and fifth rules of CIE code resemble in content the second, third, fourth, and fifth rules of ASCE's. Another similarity between these two codes is that both express their standards as negatives (though both the original CIE proposal and Yun's alternative mixed negative standards with positive). Like other early codes of engineering ethics, both have much to say about treating fellow engineers decently and avoiding conduct likely to hurt the reputation of the profession as a whole. There is no mention of the public welfare in either.

There are also significant differences between the CIE code and the ASCE's. Four stand out. First, the CIE's code is much briefer than the ASCE's, about half its length. Second, the ASCE code opens with this preamble: "It shall be considered unprofessional and inconsistent with honorable and dignified bearing for any member of the American Society of Civil Engineers." The CIE code has no such opening nor is it clear (as it is from the ASCE preamble) that the rules of the CIE code apply only (or even primarily) to CIE members. Third, unlike the ASCE code, which mentions "client" twice, the CIE code mentions neither "client" nor "employer," substituting the more general idea of "duty" (but not, as in Yun's proposal, "duty to the profession"). Fourth, the order of rules differs substantially, though neither code gives a rationale for its ordering. Presumably, in both codes, the more important rules come earlier. The difference in order between the two codes thus suggests a difference in priorities—with, for example,

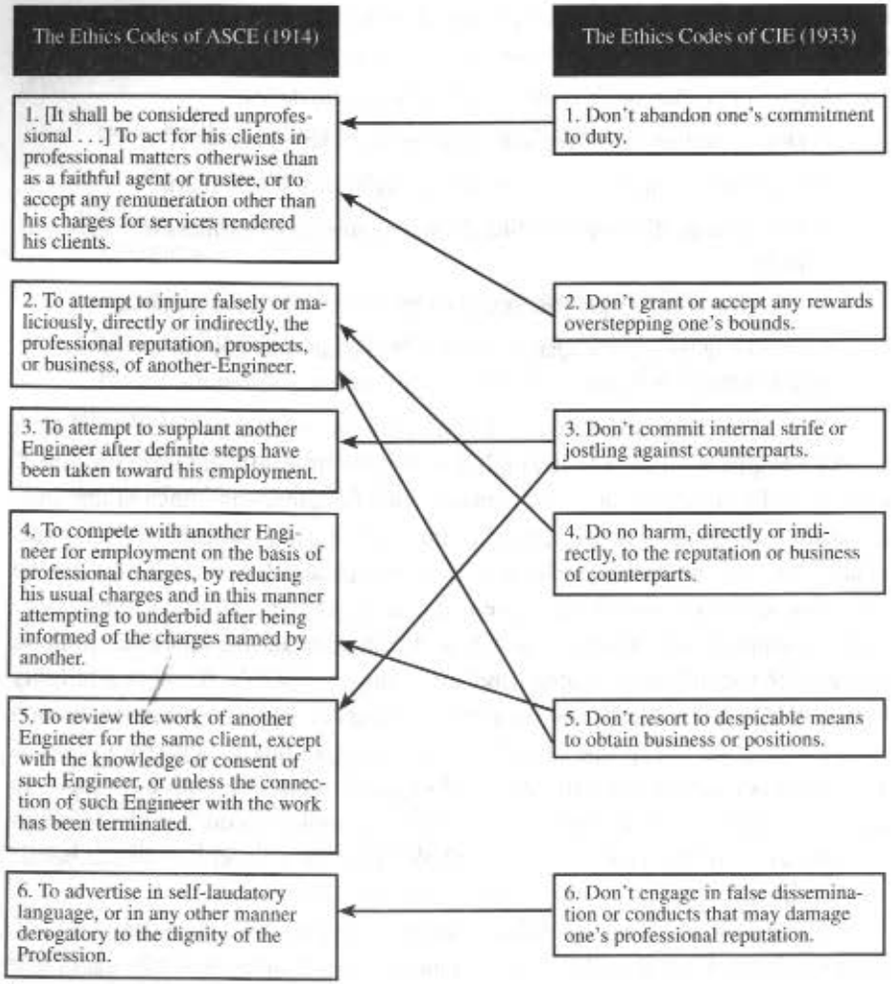

Figure 1

the CIE code treating doing one's duty as the first obligation of an engineer rather than (as in the ASCE code) being a faithful agent or trustee of one's client. The CIE code is, then, far from being a mere copy of the ASCE code.

Let us briefly compare the process by which the CIE code came into being with the corresponding process at the ASCE. The ASCE seems to have held at least three formal discussions of a code of ethics between 1852 and 1914.[24] Thus, sixty-two years elapsed between the founding of the ASCE and the day when ASCE members finally approved the first ASCE code. In contrast, the CIE took only two years from its founding in 1931 to adopt its first code of ethics

in 1933. The existence of precedents in other engineering societies, such as the ASCE, may have sped the process in the CIE. After all, by the time the ASCE adopted its code in September 1914, it had at least three recent precedents.[25] The American Institute of Electrical Engineers had adopted its first code in March 1912; the American Institute of Chemical Engineers, a different code in December 1912; and the American Society of Mechanical Engineers, its own in June 1914. Interestingly, all three of these precedent codes were several times the length of the ASCE's.

Why is the CIE code so similar to the ASCE code? An obvious explanation is that at that time civil engineering was by far the largest of all the fields of engineering in China. For example, in 1924, the membership of the Zhong Hua Engineers Society numbered 487, with civil engineers numbering 387, that is, about 80% of the total (with mechanical engineers numbering 41, electrical engineers numbering 26, mining and metallurgy engineers numbering 18, and chemical engineers numbering 6).[26] In 1935, civil engineers were still almost half of the CIE membership.[27] The members of CIE committee that drafted the code were also nearly half civil engineers. All but one of these had studied engineering outside China; some had even been ASCE members. Ling Hongxun, one of the original members of the CIE code of ethics committee, had studied at Columbia University in 1915. He was a lifelong ASCE member. Li Shutian, who studied engineering at Cornell University in 1923, was a former ASCE member. Naturally, then, in the process of drafting the CIE code of ethics, these committee members might well have referred to the ASCE code, regarding it as a model.

For more about the background of engineers involved in writing the CIE code, see the chart below. Note that some of the committee members had trained in Europe (France or Germany). The code does not seem to have been a project only of American-trained engineers.

What then explains the differences between the ASCE Code of Ethics and CIE's? The obvious answer may seem to be differences between "American culture" and "Chinese culture," especially the influence of Confucianism in China. That may indeed also be the right answer. But it is worth noting that there is nothing particularly Confucian, or even Chinese, about the CIE code or the two proposals out of which it grew. For example, all three codes consist of commands. None is a list of Confucian virtues. So, another obvious answer is that some of the differences between the ASCE's code and the CIE's, perhaps all of them, are simply the result of clever minds seeking improvements over what came before, the same reason American engineers have produced so many different codes of ethics.[28] Here are two hypotheses historians might want to investigate.

The Second Period: War, 1934–1948

The war between China and Japan plainly influenced the second period of codes of engineering ethics in China (1934–1948). The war began when Japan invaded Manchuria in 1931, but did become a life-and-death struggle until Japan invaded China proper in 1937. China then faced the huge challenge of developing wartime industry, fielding large armies, and maintaining the infrastructure of normal life during a modern war fought over much of a very large country.

At the beginning of the war, China lost great swaths of territory, including its capital, forcing the CIE back to Chongqing city, where it continued its technical activities and meetings. In 1938, the CIE established a "Military Engineering Committee" to focus on doing research on military-related aspects of civil, mechanical, chemical, and communications engineering.[29] At the same time, the CIE proposed topics for research, for example, an "Industrial Plan" with sixteen guidelines for developing needed industries and ninety-one principles of implementation.[30] Engineering standards were crucial to the Plan. Engineering

Table 1. Backgrounds of engineers who help to draft the CIE ethics code. This chart was derived from the "General Report of the 21st Meeting of CIE," *Engineering Weekly*, and other meeting reports.

Name	Studying University	Engineering Field	Status in CIE	Work on Ethics Code
Wang Huatang	Cornell University	Civil engineering Master's degree	Member of CIE since 1926	Suggestion
Li Shutian	Cornell University	Civil engineering	Formal member of ASCE	Suggestion and formulation
Hua Nangui	Ecole Spéciale des Travaux Publics du Bâtiment et del'Industrie	Civil engineering	Vice president of Zhong Hua Engineers Society (1918)	Formulation
Qiu Lingyun	Shanghai Jiaotong University	Electrical engineering	President of CIE	Formulation
Yun Zhen	University of Wisconsin	Electrical engineering	Vice president of CIE (1934)	Formulation by himself
Ling Hongxun	Columbia University	Railroad engineering	Vice president of CIE (1918) Lifelong member of ASCE	Modification
Hu Shuhua	Technische Universität Berlin	Iron and steel engineering	Vice president of CIE (1931)	Modification

standards were then so many and varied that they hindered military production. For example, metal, cement, and other construction materials came in so many forms that those ordering supplies for a project had trouble determining what they should order. Ordering the wrong materials could cause substantial delays in war-related work when timing was crucial.[31]

In 1942, the CIE established an experimental committee for engineering material. Until 1945, that committee edited the "experimental handbook of metallic material," "the code of probative cement," "codes and experimental methods of electrical insulation material," "the codes and experimental methods of oils," and so on.[32]

As part of promoting industrial development, military technology, and efficient standards of engineering, the CIE rewrote its ethics code to encourage engineers to work appropriately in this new context. In 1940 in Chengdu city, at its ninth annual meeting, the CIE discussed the idea that the chief responsibility of engineers should be to the nation. In 1941, the CIE formally adopted a new code of ethics consisting of eight rules, all stated positively.[33] This may well be the only (formally adopted) code of engineering ethics ever to be stated entirely in positive form:

> 1. Comply with the policies of national defense and economic development to carry out the industrial plan of our Founding Father.
>
> 2. Be aware of the priority of the national interests and willing to sacrifice one's freedom for them.
>
> 3. Promote the national industrialization for self-sufficiency in main goods.
>
> 4. Develop industrial standardization to meet the needs of national defense and people's livelihood.
>
> 5. Resist the temptation of fame and fortune, safeguard the professional dignity, and abide by professional ethics.
>
> 6. Seek truth from the facts, and pursue perfection, independent innovation and collaborative achievements.
>
> 7. Undertake challenges, adhere to professional obligations and, most of all, value cooperation.
>
> 8. Be disciplined with oneself and lenient towards others, and develop such living habits as being neat, thrifty, responsive, and honest.[34]

Plainly, the 1941 code, or rather the first half, was designed for wartime and related political needs. Hence, the use of "national" in Rules 1–4 and the reference to "our Founding Father" in Rule 1. The remaining Rules (5–8) could

have appeared in the 1933 code—or, indeed, in a Japanese or American code of engineering ethics. Of course, the last Rule (8) is unusual insofar as it specifies virtues not generally mentioned in codes of engineering ethics ("such living habits as being neat, thrifty, responsive, and honest"). Here perhaps is a Confucian influence.

Nonetheless, there are at least two ways in which the 1941 code may be an advance over the CIE's 1933 code (at least from today's perspective):

First, the national interest was to be the core value for all engineers, not the interests of individuals, such as other engineers, nor even the interests of engineering as a whole. All the activities of engineers were to serve the nation. So, for example, Rule 2 called for engineers to sacrifice personal freedom for the nation. Insofar as "the nation" is more inclusive than "the profession" (and the war with Japan was just), Rule 2 was a step toward recognizing the public interest as engineering's overriding concern.

There are, of course, at least two objections to this claim. One is that "profession" in general, and the engineering profession in particular, are cosmopolitan concepts. They do not necessarily respect national borders. So, for example, Chinese engineers (at least arguably) belonged to the same profession as American engineers—or even Japanese engineers. The other objection is that the public interest is, in principle, wider than the national interest—and, even in practice, not always the same, especially in a time of war with another country. So, for example, the "national interest" of Nazi Germany has a sinister aspect that the "public interest" does not, since (even in Nazi Germany), the "public interest" might include many not included in the national interest, that is, all those who, though adversely affected by engineering, lack the knowledge, skill, judgment, or opportunity to protect themselves. (Davis, 1998, Chapter 4.)

Yet, while we admit the force of both objections, we also think that, given the limited reach of Chinese engineering at the time (and the justice of China's defensive war), the move from the interests of the profession to the interests of the nation was a step toward recognizing the public interest (as was the reference to the "people's livelihood" in Rule 4), that is, a step toward recognizing the interests of those non-engineers, non-clients, and non-employers who rely on engineers to protect their health, safety, and welfare. Indeed, the nation's needs, as the new code understood them, were not necessarily in conflict with good engineering. Rules 4–7 are certainly rules of good engineering: Through setting standards for industry, maintaining the dignity of engineering, encouraging technological innovations and collective achievements, carrying forward collaborations with other engineers, and adhering to engineering's obligations,

engineers could improve engineering as well as help the nation. Even Rule 8 seems consistent with good engineering, though its demands go beyond professional conduct to habits of "living."

Of course, there are also respects in which the 1941 code is clearly not an advance beyond American codes of the period. For example, the 1941 code says nothing about working only within areas of one's competence, a common feature of American codes going back to 1912. There are also ways in which we (the readers of this article as well as its authors) might today want to improve the 1941 code, though other codes of that time lacked the provisions, for example, by adding a few words about environment or conflict of interest. We do not claim that the 1941 code is *overall* better than its Chinese predecessor, much less that it is better than other codes of that time. We are not even sure how to make such global assessments, all thing considered.

What we do claim is that the 1941 code should give pause to those who think codes of engineering ethics are "*mere* window dressing." The 1941code was written in the middle of a desperate war, replacing a code barely eight years old. The engineers who wrote the new code must have thought it important enough to take time from activities more directly related to the war. The 1941 code seems designed to guide conduct—or, at least, to state standards Chinese engineers wanted other Chinese engineers to follow so much that they were willing to do the same. The 1941 code does not seem designed to be an instrument of "public relations," a display designed merely to please the outside world. If it was designed for outsiders at all, it was designed to let the Nationalist government know what to expect of engineers.

We do not, unfortunately, have a way to assess what part the 1941 code actually had in the work of engineers, for example, whether it actually guided the conduct of any engineers or merely documented standards most engineers recognized whatever the code said. Indeed, we do not even know such things about later Chinese codes of ethics. Such ignorance invites research.

Interestingly, events in the United States at this time were following a similar path. In 1932, in the middle of "the Great Depression," the Engineers Council for Professional Development (ECPD), an organization of organizations (rather than, like the CIE, of individuals), was founded. Among its aims was to write a code of engineering ethics acceptable to all its constituent organizations. This it achieved only in 1947. That code made it a duty (among many) for an engineer to "interest himself in the public welfare and be ready to apply his special knowledge, skill, and training for the benefit of mankind." (Rule 23).[35] The ECPD code underwent a complete revision in 1974. Among

many innovations was the influential Rule 1: "Engineers shall hold paramount the health, safety, and welfare of the public in the performance of their duties."[36] Thus, the CIE may have been ahead of the ECPD in undertaking a relatively explicit responsibility to the public—if, at the time, "nation" (in China) was the rough equivalent of "public" (in the United States in 1947 or 1974) or at least something much less insular than employer, client, or profession.

Third Period: Taiwan after the Revolution, 1949–Today

The third period of the history of engineering ethics in China (1949 to today) has two main branches: the Mainland branch and the Taiwanese branch. On the Mainland, there were many engineering societies but no formal code of engineering ethics for almost half a century. On Taiwan, the CIE rebuilt after its flight from the Mainland in 1949, becoming an important means for Taiwanese engineers "to strengthen close ties and interactions between members and professional institutes worldwide" and "to advance technology, expertise, and professionalism in engineering."[37]

The CIE maintained its 1941 code unchanged until 1976 (perhaps because Taiwan considered itself still to be at war, though with Mainland China rather than Japan). Then, in 1976, it made only one small change (apparently, a clarification), replacing "one's freedom" in Rule 2 with "oneself" so that the amended rule read "Be aware of the priority of the national interest; be willing to sacrifice oneself for it."[38]

Then, on November 10, 1994, at its 59th annual meeting, the CIE set up a committee both to formulate a new ethics code and to do research on engineering ethics in Taiwan—to clear up misunderstandings of engineers, improve the reputation of engineers, and maintain the dignity of engineering. After much work, including the study of codes of ethics of many foreign countries, the CIE adopted a new code of ethics in 1996.[39] The 1996 code seems to owe little to either CIE's 1933 or 1941 code. The 1996 code distinguished four kinds of responsibility: to society, to the profession, to employers, and to colleagues:

Engineer's social responsibility

Lawfulness and dedication: follow laws and regulations, protect public safety, and improve all citizens' well-being.

Respect nature: maintain the ecological balance, cherish natural resources, and preserve cultural heritage.

Engineer's professional responsibility

Professional Dedication: apply professional knowledge and skills, maintain professional discipline, and enforce engineering practices.

Innovation and perfection: absorb advanced technology knowledge, commit to perfection, and improve product quality.

Engineer's employer responsibility

Sincere services: contribute all your talents and wisdom to provide the best service, and achieve job objectives.

Mutual trust and benefit: establish mutual trust, foster win-win consensus, and accomplish engineering goals.

Engineer's colleague responsibility

Cooperation and collaboration: collaborate professionally, emphasize cooperation, and coordination and improve operational efficiency.

Heritage continuation and future inspiration: engage in self and mutual encouragement, inherit technological know-how and experience from predecessors, and develop new talents.

In order to make application of the code easier, the CIE appended forty-eight "operating rules" (2007 Chinese characters), for example, under "respect nature" were such "operating rules" as "When making plans for industry, give priority to adopting environmentally friendly equipment, goods and materials; reduce environmental pollution caused by waste; take advantage of advanced science and technology; protect the cultural heritage; [and so on]."[40]

In format, especially in its length and fourfold division, the CIE code most resembles the IEEE ethics code of 1979—abandoned in 1990—but still differs considerably. The CIE code is much shorter than the IEEE's 1979 code, has titles rather than numbered "articles," has no preamble, and orders its rules differently. The difference in order of rules seems especially significant. In the CIE code, engineers have responsibilities to "society, profession, employer, and colleague" (putting society first) while the IEEE code lists the same items in a different order: profession, colleague, employer, and society (putting society last).[41]

The content of the two codes also differs significantly. For example: The first item of the CIE code defines the engineer's social responsibility as protecting the public safety, the citizen's well-being, and the environment. The IEEE's code did not include a rule about the environment until the total revision in 1990 (just six years before the CIE adopted its new code). The last "article"

of the IEEE's 1979 code defines "fulfilling their responsibilities to the community" as including "protect[ing] the safety, health and welfare of the public and speak[ing] out against abuses in those areas affecting the public interest." Even today, the CIE code lacks any mention of speaking out against abuses ("whistleblowing").

The CIE's 1996 code seems both more innovative than the IEEE's 1979 code and more parochial (even though it does not much resemble earlier Chinese codes). On the innovative side, there is the requirement that engineers "maintain the ecological balance, cherish natural resources and preserve cultural heritage." No significant American code of engineering ethics in 1996—or, indeed, even today—calls upon engineers to "preserve cultural heritage" (though most American engineers might consider that a worthy undertaking).[42] On the parochial side is the CIE's limiting the concern of engineers to improving "all *citizens'* well-being"; recent American codes of engineering ethics, including the IEEE's 1979 code, require engineers to "hold paramount the *public* health, safety and welfare."[43] No significant American code has ever limited the obligations of engineers to fellow citizens. The 1996 CIE code thus seems to combine the new tendencies of ethics codes in the United States (such as concern for the environment) with local Taiwanese concerns (such as preserving cultural heritage). Like its predecessors, this CIE code is far from being a mere copy of any foreign code.

In the twenty-first century, serious engineering accidents seem to have damaged both the morale and reputation of Taiwanese engineers, making Taiwanese engineers worry about their ability to continue to compete in the global economy.[44] The CIE decided that its current code of ethics does not do enough to preserve the morale and reputation of Taiwan's engineers. The CIE reached much the same conclusion about other aspects of the profession in Taiwan, including education. It therefore developed a strategic plan (to be carried out by 2021) to promote mutual recognition among engineers internationally and accreditation of engineers at home to enable Taiwanese engineers to work anywhere in the world. The CIE intends to develop attitudes and practices that meet international standards.[45] To carry out this intention, the CIE committee on ethics undertook to foster and improve engineering norms, advocate engineering ethics concepts, popularize engineering ethics education, criticize engineering accidents, improve the qualities of engineering programs, maintain the dignity of the engineering profession, and promote the engineers' imagination.[46] As part of this undertaking, the CIE has sponsored such activities as making June 6 "Engineers' Day," holding a Joint Annual Convention with affiliated industries, and giving awards for outstanding contributions to engineering research, development, and practice.[47]

Third Period: Revolution on the Mainland, 1949–Today

On the Mainland, the period between 1949 and today can be divided into three sub-periods. During the first, the People's Republic came into being and began building a socialist economy. This sub-period lasted about thirty years, ending with the collapse of the Cultural Revolution in 1978. During those thirty years, there was no formal code of ethics for engineers. All occupations, including engineering, were to do their best for the nation under the direction of the new government. Central administration left no room for voluntary associations like professions—or for their special standards. Indeed, during much of this period, especially, during the Great Leap Forward and the Cultural Revolution, even technical expertise was suspect. In the second sub-period, starting with the policy of Reform and Opening-up (1978), China began to develop a market economy, reducing considerably the control that government exercised over society. Technical organizations slowly changed their role, coming increasingly to resemble their counterparts in the West. Engineering education improved. In the third sub-period, beginning near the end of the twentieth century, professional organizations again began adopting codes of ethics. There was also considerable effort put into accrediting engineering programs using international standards. Among these international standards were requirements for teaching engineering ethics.[48]

The China Association for Science and Technology (CAST) is the largest national non-governmental organization of scientific and technological workers in China.[49] It includes (along with scientific societies) more than seventy engineering societies, including the Chinese Mechanical Engineering Society, the Chinese Society for Electrical Engineering, the Chemical Industry and Engineering Society of China, and the China Civil Engineering Society. While none of these engineering societies seems to have a formal ethics code, most of their constitutions have fragments of a code, for example, a commitment to obey "public ethics" (ordinary morality) and to help to develop the economy. The constitutions of a few of these engineering societies even mention "sustainable development" or "the public welfare." That is true, for example, of the most recent constitution of the Chinese Mechanical Engineering Society (2011) and of the China Electro-technical Society (2015).

Though most Mainland engineering societies still seem to attach no importance to having a formal code of engineering ethics, there are many exceptions. Among these are: Engineering Consultant Professionals (2015); Survey and Design Engineering Professionals (2014); and Plant Consultant Engineers (2009). The China National Association of Engineering Consultants seems to have been

the first Mainland engineering society to adopt a code of ethics since 1949, perhaps because it has been a formal member of the Fédération Internationale des Ingénieurs Conseils (FIDIC) since 1996. It adopted the Mainland's first post-revolution code of engineering ethics in 1999, revising it in 2010.[50] That code now has ten clauses. Clauses 1, 3, and 10 concern responsibility for developing the profession and maintaining its dignity; clause 2 concerns loyalty to one's employer and keeping its secrets; clauses 4, 6, 7, and 9 concern developing the profession, promoting improvement of technology, communications with foreign societies, doing work within one's competence, and not accepting bribes. Clauses 5 and 8 state that engineers and their colleagues should cooperate with each other and compete fairly.

The China Engineering Cost Association adopted a code of ethics in 2002.[51] That code has only eight clauses but otherwise resembles the code of ethics of the Chinese Association of Engineering Consulting. In some respects, it also resembles the CIE's 1933 code, for example, in having provisions concerned with maintaining the profession's dignity, friendly cooperation with colleagues, and responsibility for the profession. There are, however, important differences as well, for example, an emphasis on the public welfare, avoiding conflicts of interest, and delivering objective, fair judgment in professional matters.

About this time (2004), the Chinese Academy of Engineering (founded in 1994 as the highest honor organization in engineering and technology) joined with the National Academy of Engineering of Korea and the Engineering Academy of Japan to issue a "Declaration of Engineering Ethics." This document called on "*Asian* engineers" to be (among other things) responsible for the public safety, health, and welfare and to do their best to realize sustainable development when they make engineering decisions.[52] It implied that all "Asian engineers" have the same (minimum) responsibilities, that engineering ethics is not a matter of mere nationality.

A decade ago Su and Cao argued that China lacks a modern code of engineering ethics and that Chinese engineers lack moral sensitivity.[53] We think there is good reason to disagree *today*.

First, the sixty-four engineering societies they studied all belonged to the Chinese Academy of Engineering. Su and Cao did not study engineering societies not belonging to the Academy. There were a significant number of these, including the China National Association of Engineering Consultants (CNAEC) and the China Engineering Cost Association (CECA). Some of these had codes of ethics even then.

Second, the research that Su and Cao relied on is now a decade old. Much has happened in China since 2007. For example, there have been many serious engineering accidents, including the almost simultaneous explosion of chemical plants in Tianjin and Shandong in 2015.[54] Not only engineers but also their managers seem increasingly to realize that they need to pay more attention to ethical issues such as the public safety, health, and welfare. So, for example, the Baosteel Group now emphasizes social responsibility.[55] Zhao Zhouli, a Deputy General Manager at Baosteel, has even pointed out that the company needs "moral engineers" to compete for engineering work with other companies.[56]

The Chinese government seems to be of the same opinion. In 2001, the Ministry of Human Resources and Social Security proposed a system for registering engineers in China. The system was operating by 2010 and many rules have been formulated to define the legal responsibilities of engineers. Among those rules are some similar to those in codes of engineering ethics, for example: keeping secrets; protecting the public interest; guaranteeing the quality of products; not being hired by two employers at the same time; carrying out engineering activities only within the scope of one's competence; and avoiding conflicts of interest.[57]

In June 2013, the Chinese Academy of Engineering held a meeting about the ethical problems of science and technology in which many experts (including one of this article's authors, Zhang) took part. Most of these experts called on the Academy to promote engineering ethics and formulate a code of engineering ethics for China.

On June 2, 2016, the China Association for Science and Technology (CAST) became a member of Washington Accord. CAST had undertaken to promote reform of engineering education in China, especially developing the ability of students to communicate, collaborate, and act in a socially responsible way and according to engineering ethics. Many organizations and universities are initiating courses in engineering ethics. So, for example, the National Engineering Professional Degree Graduate Education Steering Committee started an engineering ethics course in 2014, and published an engineering ethics textbook in 2016.[58] At about the same time (2014), Tsinghua University set up a forum for engineering ethics, inviting many experts in engineering education and prominent engineers to give speeches on engineering ethics. In 2016, Tsinghua began training teachers from more than forty universities and colleges to improve their ability to teach a course in engineering ethics.[59]

There are at least two ways to interpret these recent developments. One, perhaps still the predominant, is to dismiss them as outliers and predict that

codes of engineering ethics will continue to have little, if any, significant role in engineering on the Mainland. The government will remain the primary, indeed, almost the exclusive, standard-setting body for engineers (and engineers will view such standards solely as law, external impositions, not also as ethics, standards they want other engineers to follow so much that they are willing to do the same).[60] Another way of interpreting recent events is to conclude that the number and importance of codes of engineering ethics in Mainland China will continue to increase. The role of the Mainland government in the setting of engineering standards will become more like that of government in Taiwan, the United States, and Europe today—and, indeed, like that of China before 1949. The Mainland's period of revolution will look more and more like an anomaly. Only the future can tell which interpretation is better. There is no reason to rule out one of these hypotheses now.

Conclusion

Codes of engineering ethics are not a recent import to China. Their roots go back more than a century, that is, at least to the founding of Zhong Hua Engineer Society in 1912. The first formal code of engineering ethics was adopted in 1933, radically revised in 1941, and again radically revised in Taiwan in 1996. There was also a slow and independent development of codes of engineering ethics on the Chinese Mainland after the reforms of 1978. While code writers in China plainly learned from Western codes, the Chinese codes were not mere copies of their Western counterparts. Indeed, the Chinese codes sometimes differed inventively from Western codes in form (for example, being wholly positive) or content (for example, protecting "cultural heritage").

The history of Chinese codes of engineering ethics makes us wonder whether those who write about codes of engineering ethics as if they were an Anglo-American export unlikely to put down roots elsewhere might have overlooked many other early codes outside English-speaking countries. Certainly, they have overlooked one. On May 7, 1999, the Board of Directors of the Japan Society of Civil Engineers issued its new code of ethics. The Preamble began:

> In March of 1938, the Japan Society of Civil Engineers promulgated "the Beliefs and Principles of Practice for Civil Engineers." This had initially been prepared in February of 1933 and was later codified by an entrusted committee on mutual rules of the Japan Society of Civil Engineers (the Chairman was Dr. Akira Aoyama, an ex-president of the Society). In 1933, Japan declared its withdrawal from the League of Nations, a turning point prior to the later Lukouchiano (Marco Polo Bridge) Incident that led to War with China and the Pacific War. Despite the trends of such an era, the Japan Society of Civil Engineers is proud of its insight to stipulate its "Beliefs and Principles of Practice for Civil Engineers."[61]

So, codes of engineering ethics seem to have roots in Japan almost as old as in China. If in both China and Japan, then why not other countries using a language other than English, for example, Brazil, Mexico, or Turkey? Indeed, why not countries that disappeared after World War I, such as the Russian Empire, the Austro-Hungarian Empire, or the Ottoman Empire? Might historians have overlooked such non-English codes? We think the answer to that last question is: yes, they *might* have. We therefore offer this article as an invitation to historians, social scientists, and engineers who know a language other than English to search the archives of national libraries, local engineering societies, autobiographies of their engineers, and the like for evidence of codes of engineering ethics, or at least of thinking about engineering ethics, at least as far back as we have found them in China. Perhaps this is the time to rewrite the history of codes of engineering ethics.

We make no claim in this article about the *importance* of codes of ethics for the practice of engineering in China during the last hundred years. We do not in part because we are unsure how to measure that importance. Must engineers generally follow a code for it to be important? Or can we count a code as important if engineers just appeal to it when discussing whether certain conduct is proper? Must engineers learn the code in school or post it in their office? Or what? Working out what "importance" should mean here seems a good job for philosophers—though for another article.

But, in part too, we make no claim for the importance of codes of engineering ethics in Chinese practice because justifying those claims would require considerably more historical research than we have so far undertaken or could conveniently fit into this article—assuming, of course, that the appropriate documents have survived the years of war and revolution—and we are the right scholars to search them out (which we probably are not).

One anonymous reviewer objected to the foregoing:

> [This] drawing in of Japan in the conclusion as strengthening the general argument of the paper seems completely mistaken. Japan has almost no history of engineering ethics code development. The establishment of recent efforts is almost completely modeled on Western codes and appears to be motivated by one of two concerns: to become a member of the Washington Accord or to gain accreditation under the international standards of ABET. The tricountry effort referenced in the paper [the Asian "The Declaration of Engineering Ethics"] . . . was very much a preliminary effort which had no lasting results.

We have four responses to this objection:

First, while one example is a mere fact, several examples may suggest a pattern, with each example serving as evidence for the importance of the others in the pattern. We think our examples, though few, suggest a pattern, one inviting further research rather than dismissal. It is generally a methodological mistake to draw conclusions that block research.

Second, scholars do not now know much about what was going on in engineering ethics in Japan before World War II because no one (as far as we can tell) has undertaken a systematic study of engineering ethics in Japan for that period. The discovery of a code of ethics for civil engineers from that period came as a surprise to almost everyone interested in codes of engineering ethics. We should, then, be agnostic about whether that one code belongs to a period in which other codes developed as well. What scholars can agree on now is that there seems to be a period of fifty years or so in Japan after World War II in which (much as on Mainland China) codes of engineering ethics are absent.

Third, no doubt there is some truth to the reviewer's explanation of the revived interest in codes of engineering ethics in Japan. But historical events, especially those that endure decades and involve many people, seldom have only one or two causes. So, there is no inconsistency between the causes the reviewer suggests and the quite different one we suggest. All might help to explain the developments in question.

Fourth, one of us (Davis) has made ten trips to Japan since 2000—in part to help with integrating engineering ethics into Japan's engineering curriculum. To that traveler, the Japanese involved in the effort seemed to be moved (like their Chinese counterparts) more by various scandals involving local engineers, for example, a half dozen or so serious accidents involving nuclear reactors in the decade after the 1997 fire and explosion at the Tokaimura nuclear reprocessing plant near Tokyo, than by any other reasons. Indeed, the Japanese seemed to view ABET-like accreditation and joining the Washington Accord primarily as means of improving the ethics of Japan's engineers. The reviewer has, then, identified a question needing more study, not made an objection undermining the argument made here.

Notes

Zhang is listed as first author because he both conceived the project and did most of the research for it (all sources in Chinese and some in English as well). He also prepared the article's first (very rough) English draft. Davis initially helped him conceptualize his research, asked a few useful questions, and smoothed the first draft. The two then passed the draft back and forth for several months, refining its argument, until it became a joint work, and then continued to work on it together for almost a year. They had help with translation of codes from Wen Jianbo (Central University of Finance and Economics, Beijing), and with finding relevant works from Kelly Laas (the librarian of IIT's Center for the Study of Ethics in the Professions) and from Zhao Yachao, Wang Hao, and Xu Muxuan (three of Zhang's Master students at Beijing University of Technology). An early version of the article was presented to the Philosophy Colloquium, Illinois Institute of Technology, April 21, 2017, resulting in many small but significant revisions.

1. See, for example, the Wikipedia entry for "Engineering Ethics" (https://en.wikipedia.org/wiki/Engineering_ethics), which mentions only one non-English code of engineering ethics (a German document dating from 1950), though a document in French (from Quebec) does appear in the list of codes at the entry's end. Whatever its failures as a scholarly source, Wikipedia is pretty reliably a place to find "the common view." Compare the discussion of "profession" in Harris et al. 2014: 189–190.

2. We therefore reject reliance on etymology, for example, in Qin Zhu, "Engineering Ethics Studies in China: Dialogue between Traditionalism and Modernism," *Engineering Studies* 2 (August 2010): 85–107. "Modern engineering" has only a very loose connection with older uses of "gong cheng," much as the English use of "engineer" to refer to the driver of a railroad engine has only a loose connection with the modern use of "engineer."

3. For a defense of this definition of profession, see Michael Davis, "Is Engineering a Profession Everywhere?" *Philosophia* 37 (June 2009): 211–225.

4. Michael Davis, *Thinking Like an Engineer: Essays in the Ethics of a Profession* (New York: Oxford University Press, 1998), chaps. 1–3.

5. Zhan (b. 1861) began his modern education in America in 1872. He graduated from the Sheffield Engineering School of Yale University in 1881, majoring in civil engineering. From 1905 to 1909, Zhan designed and built the Jing-Zhang railway, the first railway designed and constructed in China without foreign assistance. Zheng Fang, "The 'Civic Leaders' of Modern Engineer Groups—The Study of Chinese Institute of Engineers (1912–1950)" (近代工程师群体的"民间领袖"—中国工程师学会研究 (1912–1950)) (Beijing: China Economy Daily Press, 2014).

6. Zhan Tongji, Huang Zhiyang, and Deng Haicheng, eds., "A Biographical Note on Tianyou Zhan" (詹天佑生平) (Guangzhou: Guangdong People's Press, 1995), 235–252; Chinese Civil Engineering Society (CCES), ed., *The History of Chinese Civil Engineering Society* (中国土木工程学会史) (Shanghai: Shanghai Jiaotong University Press, 2008), 15–16.

7. *The Report of Zhong Hua Engineers Society* (中华工程师会报告), November 11, 1913. The original Chinese reads:

1. 统一工程营造, 规定正则制度, 使无参差杆格之患;
2. 发达工程事业, 俾得利用厚生, 增进社会之幸福;
3. 日新工程学术, 力求自阐新途, 不至囿于成法.

8. Michael Davis, "Codes of Ethics," in *Encyclopedia of Science, Technology, and Ethics*, ed. Carl Mitcham (New York: Macmillan Reference, 2005), 350–353.

9. Zhan Tianyou, "Announcements of the Younger Engineers in the Transportation Engineering" (敬告交通界青年工学家), *Transportation Newspaper* (August 1918): 19–22; Zhan Tongji, ed., *The Business Writings and Business Philosophy Research of Tianyou Zhan* (詹天佑创业著述精选和创业思想研究) (Guangzhou: Guangdong Map Press, 1999), 23–25.

10. Zhan Tianyou Development Foundation for Science and Technology, ed., *The Corpus of Commemorating the 150th Birthday Anniversary of Zhan Tianyou* (纪念詹天佑先生诞辰 150 周年纪念文集) (Beijing: China Railway Press, 2011); Zhan Tongji, *Critical Biography of Zhan Tianyou* (詹天佑评传) (Zhuhai: Zhuhai Press, 2008).

11. CCES 2008: 16.

12. Huang Yan, "Review of the Last Hundred Years of Engineering Enterprises" (工程事业最近一百年来之回顾), *Engineering* 4 (1928): 3–5.

13. Cheng Wendong, "The Mission of Chinese Engineers" (中国工程师之使命), *Engineering* 5 (1930): 463–465.

14. Liu Hua, *The Research of Establishment, Development and History Position of Chinese Institute of Engineering* (中国工程学会的创建、发展及其历史地位的研究) (Beijing: Tinghua University, 2002).

15. "Summary of Yearly Meeting of Chinese Institute of Engineer (2)" (中国工程学会年会之纪要（二）), *Shen Newspaper*, August 28, 1932.

16. The reference to "military service" disappeared from later drafts. We do not know why. But one obvious answer is that later drafts seem to avoid analogies and similes altogether.

17. "21st Meeting General Report of Chinese Institute of Engineer" (中国工程师学会二十一年度会务总报告), *Engineering Weekly* 12(2) (September 1933).

18. American Society of Civil Engineers, "ASCE Code of Ethics, 1914," http://ethics.iit.edu/ecodes/node/4093 (accessed September 10, 2016).

19. "21st Meeting."

20. Ibid.

21. Ibid.

22. This is our translation. The original Chinese reads:

1. 不得放弃责任或不忠于职务;
2. 不得授受非分之报酬;
3. 不得有倾轧排挤同行之行为;
4. 不得直接或间接损害同行之名誉及其业务;
5. 不得以卑劣之手段，竞争业务或位置;
6. 不得作虚伪宣传或其他有损职业尊严之举动. (CIE 1933)

23. Su and Cao 2008: 16. Note that their translation of the code differs in small ways from ours.

24. Sarah K. A. Pfatteicher, "Depending on Character: ASCE Shapes Its First Code of Ethics," *Journal of Professional Issues in Engineering Education and Practice* (January 2003): 21–31.

25. Actually, there were even earlier precedents, in addition to the codes of ethics of other professions (such as several AMA codes); for example, Canadian Society of Civil Engineers (CSCE), "Code of Engineering Ethics," *Transactions of the Canadian Society of Civil Engineers* 10–11 (1896): 14. The CSCE code had eleven rules.

26. CCES 2008: 16.

27. Su and Cao 2008: 15.

28. This is certainly surprising, given how much has been written about the pervasiveness of Confucianism in Chinese society. See, for example, Fuguan 2014. But perhaps individuals, especially individuals trained in Europe or the United States in modern science and engineering, might have shaken off much of their Confucianism, especially in a period when Confucianism was widely regarded as obscurantist, a remnant of the past.

29. "Military Committee of CIE" (中国工程师学会组织军事委员会), *Engineering Monthly Journal* 1(1) (1939): 43.

30. Shaohua Zhong, *Shaohua Zhong Corpus* (钟少华文集) (Beijing: Chinese International Broadcast Press, 1998), 340.

31. Fang Zheng, "A Study of Chinese Institute of Engineers (1912–1950)" (中国工程师学会研究), doctoral thesis, Fu Dan University (2011), 134–141.

32. "Material Experiment Committee Report," in *32nd Meeting Report of Chinese Institute of Engineers* (材料试验委员会报告) (1943), 27–28.

33. Mao Yisheng, "A Brief History of Chinese Institute of Engineers" (中国工程师学会简史), in *Selected Writings of Cultural and Historical Material*, No. 34, Vol. 99–100, Chinese Cultural and Historical Press, 2011.

34. Chinese Institute of Engineers (CIE), "The Norms of CIE (中国工程师信条)," *Shen Newspaper*, October 28, 1941.

35. Engineers Council for Professional Development (ECPD), "Canons of Ethics for Engineers (1947)," http://ethics.iit.edu/ecodes/node/3257 (accessed May 25, 2016). But compare William H. Wisely, "The Influence of Engineering Societies on Professionalism and Ethics," in *Engineering Professionalism and Ethics* (Malabar, FL: Robert E. Krieger, 1983), 32–33.

36. Engineers Council for Professional Development (ECPD), "Canons of Ethics for Engineers (1974), http://ethics.iit.edu/ecodes/node/6401 (accessed September 27, 2016). This was not the first time this language appeared in an American code of engineering ethics, though it is the first time it appeared in a code of an important engineering society. The first time this language appeared was in the Specific Principles of Good Professional Conduct of the American Association of Engineers a few years before that organization disappeared. "Specific Principles of Good Professional Conduct," compiled by the Practice Committee of the American Association of Engineers, under the chairmanship of E. E. Carpenter (1923), codified by Dr. D. B. Steinman (Chairman, 1924–1925), and adopted by the Board of Directors in 1924, *Annals of American Academy of Political Science* (1955): 53–56.

37. CIE 2012: 11. Why did the CIE "flee" to Taiwan? Why did it not stay on the mainland? The answer seems simple. While most engineers may have remained on the mainland, most important Chinese institutions retreated to Taiwan with the Nationalist government. The CIE was just one of these.

38. "Summary of the 30th Anniversary Meeting of the Reestablished CIE" (中国工程师学会在台湾重建 30 周年纪念会务纪要), CIE Library (1984), 3.

39. CIE 1996a.

40. CIE 1996b.

41. IEEE 1979.

42. Such language does appear in one other code of engineering ethics we know of. See the last line of the Code of Conduct of the European Federation of National Engineering Associations (FEANI), 2006 (a decade after the CIE), http://ethics.iit.edu/ecodes/node/5489 (accessed September 28, 2016).

43. IEEE 1979.

44. One of this article's authors (Zhang) asked the CIE what the "accidents" were that inspired the new code. The CIE did not respond. The information cannot be found in any document he has been able to acquire.

45. CIE 2012: 2–18.

46. CIE 1996b.

47. CIE 2012: 15–16.

48. Qin 2010: 86–87, 97–99.

49. CAST 2016.

50. CNAEC 2010.

51. CECA 2002.

52. EAJ 2004.

53. Su and Cao 2007.

54. Shepard 2015.

55. Baosteel 2015.

56. Sohu Education News 2016.

57. Zhao 2016: 24–26.

58. "The Proposal for Strengthening Engineering Ethics Courses' Construction," http://www.meng.edu.cn/publish/gcss/294/2016/20160825165100440802617/20160825165100440802617_.html (accessed May 25, 2016).

59. The Forum for Engineering Ethics Education in Tsing Hua, August, 25, 2016; http://tsinghua.cuepa.cn/show_more.php?tkey=&bkey=&doc_id=1510913.

60. Su and Cao 2007.

61. Japan Society of Civil Engineers 1999.

References

American Association of Engineers (AAE). 1955. "Specific Principles of Good Professional Conduct." *Annals of American Academy of Political Science*: 53–56.

American Society of Civil Engineers (ASCE). 1914. "Engineering Ethics." http://ethics.iit.edu/ecodes/node/4093 (accessed September 10, 2016).

Baosteel. 2015. "Social Responsibility." http://www.baosteel.com/group_en/channels/2924.html (accessed September 15, 2016).

Canadian Society of Civil Engineers (CSCE). 1896. "Code of Engineering Ethics." *Transactions of the Canadian Society of Civil Engineers* 10–11: 14, http://ethics.iit.edu/ecodes/node/6062 (accessed May 25, 2016).

Chen Lai. 2014. "The Chinese Traditional Cultures and Core Values." (中国传统文化与核心价值观). *GuangMing Daily*, August 11. http://epaper.gmw.cn/gmrb/html/2014-08/11/nw.D110000gmrb_20140811_1-16.htm (accessed May 25, 2016).

Cheng Wendong. 1930. "The Mission of Chinese Engineers" (中国工程师之使命). *Engineering* 5: 463–465.

China Association for Science and Technology (CAST). 2016. http://english.cast.org.cn/n1181872/n1257426/16297382.html (accessed May 25, 2016).

China Engineering Cost Association (CECA). 2002. "Code of Ethics," http://www.ceca.org.cn/show.aspx?id=3050&cid=48 (accessed May 25, 2016).

China National Association of Engineering Consultants (CNAEC). 2010. "Ethics Codes." http://www.cnaec.com.cn/application/zhiyedaodexingweizhunze.asp (accessed May 25, 2016).

Chinese Civil Engineering Society (CCES), ed. 2008. *The History of Chinese Civil Engineering Society* (中国土木工程学会史). Shanghai: Shanghai Jiaotong University Press.

Chinese Institute of Engineers (CIE). 1933. "Code of Ethics" (中国工程师信守规条), Wuhan annual meeting record of CIE. *Engineering Weekly* 12(2) (September): 178.

Chinese Institute of Engineers (CIE). 1941. "The Norms of CIE" (中国工程师信条). *Shen Newspaper*, October 28.

Chinese Institute of Engineers (CIE). 1996a. "Code of Ethics." http://www.cie.org.tw/Important?cicc_id=3 (accessed May 25, 2016).

Chinese Institute of Engineers (CIE). 1996b. "Operating Procedures" (中国工程师信条实行细则). http://www.cie.org.tw/Important/ImportantDetail?cic_id=15&cic_cicc_id=4 (accessed May 25, 2016).

Chinese Institute of Engineers (CIE). 2012. "The 2021 Development Strategic of the Chinese Institute of Engineers" (中工会 110 年发展策略白皮书), April 27. http://www.cie.org.tw/cms/upload/files/2012%20Development%20Strategy%20of%20CIE(2).pdf (accessed September 22, 2016)

Davis, Michael. 1998. *Thinking Like an Engineer: Essays in the Ethics of a Profession*. New York: Oxford University Press.

Davis, Michael. 2005. "Codes of Ethics." In *Encyclopedia of Science, Technology, and Ethics*, ed. Carl Mitcham, 350–353. New York: Macmillan Reference.

Davis, Michael. 2009. "Is Engineering a Profession Everywhere?" *Philosophia* 37 (June): 211–225.

Department of General Administration of Chinese Academy of Engineering, ed. 2005. *Chinese Academy of Engineering Yearbook* (中国工程院年鉴). Beijing: Higher Education Press.

Engineering Academy of Japan (EAJ). 2004. "The First Ten Years: East Asia Round Table Meeting of Academies of Engineering." http://ethics.iit.edu/ecodes/node/5076 (accessed May 25, 2016).

Engineers Council for Professional Development (ECPD). 1947. "Canons of Ethics for Engineers." http://ethics.iit.edu/ecodes/node/3257 (accessed May 25, 2016).

Engineers Council for Professional Development (ECPD). 1974. "Canons of Ethics for Engineers." http://ethics.iit.edu/ecodes/node/6401 (accessed September 27, 2016).

Fang Zheng. 2011. "A Study of Chinese Institute of Engineers (1912–1950)" (中国工程师学会研究). Doctoral thesis, Fu Dan University.

Fuguan Xu. 2014. *Confucianism and Modern Society*. Beijing: Jiuzhou Press.

Harris, Charles E., Michael S. Pritchard, Michael J. Rabins, Ray James, Elaine Englehardt. 2014. *Engineering Ethics: Cases and Concepts*. Boston: Wadsworth.

Huang Yan. 1928. "Review of the Last Hundred Years of Engineering Enterprises" (工程事业最近一百年来之回顾). *Engineering* 4: 3–5.

Institute of Electrical and Electronics Engineers (IEEE). 1979. "Code of Ethics." http://ethics.iit.edu/ecodes/node/3244 (accessed May 25, 2016).

Institute of Electrical and Electronics Engineers (IEEE). 1990. "Code of Ethics." http://ethics.iit.edu/ecodes/node/3246 (accessed May 25, 2016).

Japan Society of Civil Engineers. 1999. "Code of Ethics." http://ethics.iit.edu/ecodes/node/3253 (accessed March 25, 2017).

Liu Hua. 2002. *The Research of Establishment, Development and History Position of Chinese Institute of Engineering* (中国工程学会的创建、发展及其历史地位的研究). Beijing: Tinghua University.

Mao Yisheng. 2011. "A Brief History of Chinese Institute of Engineers" (中国工程师学会简史). In *Selected Writings of Cultural and Historical Material*, No. 34, Vol. 99–100. Chinese Cultural and Historical Press.

National Society of Professional Engineers (NSPE). 1957. "Canons of Ethics for Engineers." http://ethics.iit.edu/ecodes/node/3258 (accessed May 25, 2016).

Pfatteicher, Sarah K. A. 2003. "Depending on Character: ASCE Shapes Its First Code of Ethics." *Journal of Professional Issues in Engineering Education and Practice* 129(1) (January): 21–31. https://doi.org/10.1061/(ASCE)1052-3928(2003)129:1(21)

Qin Zhu. 2010. "Engineering Ethics Studies in China: Dialogue between Traditionalism and Modernism." *Engineering Studies* 2(2) (August): 85–107. https://doi.org/10.1080/19378629.2010.490271

Shaohua Zhong. 1998. *Shaohua Zhong Corpus* (钟少华文集). Beijing: Chinese International Broadcast Press.

Shepard, Wade. 2015. "Seven Reasons Why China Is So Disaster-Prone." *Horizons* (September 2). http://www.citymetric.com/horizons/seven-reasons-why-china-so-disaster-prone-1369 (accessed September 14, 2016).

Sohu Education News. 2016. "Engineering Ethics Education Forum Held at Tsinghua University." http://learning.sohu.com/20160825/n465982828.shtml (accessed March 25, 2017).

Su Junbin and Nanyan Cao. 2007. "A Study of Professional Code of Ethics Based on an Investigation into Bylaws of Registered Professional Engineer and Constitution of Engineering Society in China" (中国注册工程师制度和工程社团章程的 伦理意识考察). *Journal of HuaZhong Science and Technology University* (Social Science edition) 4: 95–100.

Su Junbin and Nanyan Cao. 2008. "A Study of the Evolution of Ethics Considerations of Chinese Engineers: Based on a Historic Inquiry into the Revisions of the Ethics Code of China Institute of Engineer from 1933 to 1996" (中国工程师伦理意识的变迁——关于《中国工程师信条》 1933–1996 年修订的技术与社会考察). *Journal of Dialectics of Nature* 6: 14–19.

Wikipedia. "Engineering Ethics." https://en.wikipedia.org/wiki/Engineering_ethics (accessed May 25, 2016).

Wisely, William H. 1983. "The Influence of Engineering Societies on Professionalism and Ethics." In *Engineering Professionalism and Ethics*, 28–37. Malabar, FL: Robert E. Krieger.

Zhan Tianyou. 1918. "Announcements of the Younger Engineers in the Transportation Engineering" (敬告交通界青年工学家). *Transportation Newspaper* (August): 19–22.

Zhan Tianyou Development Foundation for Science and Technology, ed. 2011. *The Corpus of Commemorating the 150th Birthday Anniversary of Zhan Tianyou* (纪念詹天佑先生诞辰 150 周年纪念文集). Beijing: China Railway Press.

Zhan Tongji, ed. 1999. *The Business Writings and Business Philosophy Research of Tianyou Zhan* (詹天佑创业著述精选和创业思想研究), 23–25. Guangzhou: Guangdong Map Press.

Zhan Tongji. 2008. *Critical Biography of Zhan Tianyou* (詹天佑评传). Zhuhai: Zhuhai Press.

Zhan Tongji, Huang Zhiyang, and Deng Haicheng. 1995. "A Biographical Note on Tianyou Zhan" (詹天佑生平). In *Zhan Tianyou and China Railway and Engineering Construction* (詹天佑生平志:詹天佑与中铁路及工程建设), ed. Zhan Tongji, Huang Zhiyang, and Deng Haicheng, 235–252. Guangzhou: Guangdong People's Press.

Zhang Fuliang. 1928. "The Speech Records of the 10th Annual Conference of CIE" (中国工程学会第 10 届年会演讲记录). *Engineering* 3: 168–174.

Zhao Yachao. 2016. "Comparative Study of Engineering Codes of Ethics Between China and the U.S.A." (中美工程伦理规范比较研究). Master's thesis, Beijing University of Technology.

Reports

Forum for Engineering Ethics Education in Tsing Hua. August 25, 2016. http://tsinghua.cuepa.cn/show_more.php?tkey=&bkey=&doc_id=1510913.

"Material Experiment Committee Report." 1943. *32nd Meeting Report of Chinese Institute of Engineers* (材料试验委员会报告), 1943.

"Military Committee of CIE" (中国工程师学会组织军事委员会). 1939. *Engineering Monthly Journal* 1(1): 43.

"Proposal for Strengthening Engineering Ethics Courses' Construction, The." http://www.meng.edu.cn/publish/gcss/294/2016/20160825165100440802617/20160825165100440802617_.html (accessed September 17, 2016)

Report of Zhong Hua Engineers Society, The (中华工程师会报告), November 11, 1913.

"Summary of the 30th Anniversary Meeting of the Reestablished CIE." 1984. (中国工程师学会在台湾重建 30 周年会务纪要). (CIE Library). "Summary of Yearly Meeting of Chinese Institute of Engineer (2)." 1932. (中国工程学会年会之纪要（二）). *Shen Newspaper*, August 28.

"21st Meeting General Report of Chinese Institute of Engineer." 1933. (中国工程师学会二十一年度会务总报告), *Engineering Weekly* 12(2) (September).