Chapter 12 Prioritising People: Outline of an Aspirational Engineering Ethic

W. Richard Bowen

Abstract One of the greatest challenges for engineering is the development of an aspirational ethical foundation in the profession that redresses the present imbalanced prioritisation of technical ingenuity over helping people. This article presents an analysis that seeks to provide a basis for such reprioritisation. It begins with a brief account of ethical analyses that have traditionally been applied to engineering. Some salient aspects of medical ethics and business ethics are then considered. An aspirational engineering ethic needs to overcome the limitations of the traditional ethical views and to learn from the analysis of ethics in these other professions. The present outline is based on two philosophical sources. Firstly, writings that lie somewhat outside what is conventionally regarded as the mainstream of ethics, especially those of Buber and Levinas, but which contain profound ethical insights that can provide an important balance to prevailing views. Secondly, recent writings that build on the philosophical mainstream in especially imaginative and useful ways, especially MacIntyre's concept of a *practice*. Specific outcomes of the proposed aspirational engineering ethic for both individual engineers and engineering institutions are identified.

12.1 Introduction

At its best, engineering changes the world for the benefit of humanity. However, the great technical successes of engineering and the enormous satisfaction that engineers can gain from the purely technical aspects of their work lead to a danger – that engineers forget that technical ingenuity in itself is not the goal of engineering. The unfortunate tendency to prioritise technical ingenuity has a pervasive presence in modern engineering, we become lost in "the labyrinth of technology". ¹

W.R. Bowen (⊠)

i-NewtonWales, Caswell, Swansea, UK

e-mail: wrichardbowen@i-newtonwales.org.uk

¹The title of a book by W.H. Vandenburg (2000) Toronto: University of Toronto Press.

This tendency has two main types of undesirable outcome. Firstly, the development and application of complex but inappropriate technology. A very significant example is the design, manufacture and use of military equipment and weapons. Many of the weapons produced contravene international conventions and treaties as they cause indiscriminate injury and death. Almost a third of engineers in the US are reported to be employed in military related activities (Gansler 2003). Secondly, technology that could alleviate great human suffering is available but is not being applied as extensively or as rapidly as it could be. A critical example is that 1.1 billion people do not have safe drinking water and 2.4 billion people have no provision for sanitation, even though suitable engineering is readily available. As a result, 6,000 people die *every day* from water-related diseases, mostly children under the age of five (UNESCO 2003).

The current imbalanced prioritisation in engineering presents us with a particular challenge:

The challenge for us is to develop an aspirational ethical foundation in our profession and to redress the present imbalanced prioritisation in engineering of technical ingenuity over helping people. (Royal Academy of Engineering 2007a)

That is, we need to develop a convincing and aspirational foundation for the *over*all ethical aim of our profession. The present chapter aims to contribute to such a reprioritisation. It begins with a brief account of ethical analyses that have traditionally been applied to engineering. Some salient aspects of medical ethics and business ethics are then considered. An aspirational engineering ethic needs to overcome the limitations of the traditional ethical views and to learn from the analysis of ethics in these other professions. The present outline is based on two philosophical sources. Firstly, writings that lie somewhat outside what is conventionally regarded as the mainstream of ethics, but which contain profound ethical insights that can provide an important balance to prevailing views. Secondly, recent writings that build on the philosophical mainstream in especially imaginative and practical ways.

12.2 Ethical Viewpoints

Ethical analysis of engineering has tended to adopt consequentialism as a default position, due to its apparent simplicity and quasi-empirical basis combined with an inadequate appreciation of its philosophical limitations. These limitations include the incommensurability of consequences, the contingency and indeterminacy of outcomes, that in principle any action is allowed, that there is no provision for justice, and that the analysis is impersonal. Contractualism has also been widely applied in engineering ethics. Some engineers would view this as a default justification of their activities: if some aspect of their work is not explicitly legally forbidden then it is regarded as acceptable. The widespread development of weapons that contravene international law shows that even this minimalist view is not always adhered to. More generally, contractualism tends to secure present arrangements rather than promoting high ethical aspirations. Furthermore, the most disadvantaged individuals and nations are often excluded from agreements. An emphasis on duty, deriving in philosophical terms from Kant, has also played a significant role in the development of engineering ethics, especially as a background to the formulation of ethical codes. The respect for persons inherent in a duty approach has much to offer engineering ethics. However, the dense argumentation often associated with this approach is a barrier to its more widespread adoption by engineers, as is the apparent lack of empirical input in its most usual formulations. Virtue based approaches have had less influence on engineering ethics.

Engineering ethics can learn from the emphasis on the person in medicine. Modern medical ethics differs in two striking ways from the generally adopted approaches to engineering ethics. Firstly, there is a great emphasis on the *individual*, the patient, affected by the doctor's actions. Secondly, the doctor is emphatically *personally* accountable for decisions (General Medical Council 2006). In contrast, engineers tend to view their work as affecting populations and engineering responsibility is often diffused within an organisation. Furthermore, a key feature of the difference between the work of doctors and engineers is *proximity*. Those affected by a doctor's work are usually in his or her immediate proximity, whereas those affected by an engineer's work are frequently distant in both place and time.

Insights from business ethics are also of great relevance to engineering, especially as engineers are frequently employed in commercial organisations. Two concerns that have become apparent in the study of business ethics need specific attention in the development of an effective approach to engineering ethics. Firstly, a tendency for employees to bracket their personal ethical values, a suppression of ethical responsibility that seems to be a feature of goal- and end- oriented work environments. Secondly, social science studies of cognitive moral development which suggest that employees often function at a level of minimally acceptable ethical behaviour rather than aspiring to the highest achievable levels (Crane and Matten 2004).

The formulation of an aspirational engineering ethic needs to take into consideration the current imbalance in engineering priorities, the limitations of the philosophical analyses previously applied to engineering ethics and the lessons arising from medical and business ethics. There is a particular need to restore the priority in engineering of helping people over technical ingenuity for its own sake. There is also a need to find a formulation and vocabulary that are less formidable than those of the traditional mainstream philosophical writings. Ideally, such a formulation would build on the personal commitment to ethical behavior that most people exhibit in their personal lives. In these contexts it is worth noting that a number of philosophers have also been concerned that the mainstream of philosophical ethics has been too abstract, "What is lacking in these theories is simply – or not so simply – the person" (Stocker 1997, p. 71), and that their emphasis on systems over people can lead to serious injustices (Anscombe 1997).

12.3 The Priority of People

The challenge for any aspirational ethic is to find ways to express and promote the sympathetic side of our nature. In the context of engineering ethics it is beneficial if

such expression also provides a means of valuing technical activities. Such a means has been provided by Buber's description of human activities in terms of the "primary words" *I-It* and *I-Thou* (Buber 2004). Buber was concerned with an individual's relationship to other people and to the natural world. It is especially useful in the present context that he develops a philosophical approach to these relationships that is based on everyday experience of dealing with others and the physical world.

The world of *I-It* is that of *experiencing* and *using* with the aim of "sustaining, relieving and equipping of human life" (Buber 2004, p. 36). This includes the world in which the engineer usually would be seen as carrying out his or her professional tasks, the world of mathematical analysis and physical exploitation of materials and processes. The world of *I-It* is where a man or woman:

...works, negotiates, bears influence, undertakes, concurs, organises, conducts business, officiates ... the tolerably well-ordered and to some extent harmonious structure, in which, with the manifold help of men's brains and hands, the process of affairs is fulfilled. (Buber 2004, p. 39)

Buber observes that both in the life of an individual and with the progress of history there is a progressive augmentation of the world of *It*, "the world of objects in every culture is more extensive than that in its predecessor" (Buber 2004, p. 35). Indeed, the world of knowledge is structured around *It*, and this is essential to our existence: "You cannot hold on to life without it, its reliability sustains you" (Buber 2004, p. 31). However, in Buber's analysis the world of *I-It* is severely limited, "he who lives in *It* alone is not a man" (Buber 2004, p. 32) and indeed holds inherent dangers: "If a man lets it have the mastery, the continually growing world of *It* overruns him and robs him of the reality of his own I" (Buber 2004, p. 41) for, "The primary word *I-It* can never be spoken with the whole being" (Buber 2004, p. 11). That is, fulfilment in life, living a fully human life, comprises more than just experiencing and using.

The world of I-Thou² is characterised by *meeting*. Buber's writing is more poetic than is usual in philosophical works, and he illustrates his core meaning in the following progression:

Consider a tree... I can look on it as a picture... I can perceive it as movement... I can classify it in a species and study it as a type... I can subdue its actual presence and form so sternly that I recognise it only as an expression of law... I can dissipate it and perpetuate it in a number... In all this the tree remains my object... It can, however, also come about, if I have both will and grace, that in considering the tree I become bound up in relation to it. The tree is now no longer an It, I have been seized by the power of its exclusiveness. (Buber 2004, p. 14)

What is significant here is the possibility of a close relationship engendering *care* for the other. Buber chooses a tree, an inanimate object, as his primary example. In

²"Thou" corresponds to "Du" in the original German or to "Tu" in French. Its use has fallen out of modern English. However, just as the corresponding words in modern German and French, it was earlier used to indicate a close relationship with the person addressed.

the case of a person the relationship is more intimate for the response of the other may be explicit.

Further, Buber notes that, "The relation to the *Thou* is direct. No system of ideas, no foreknowledge, and no fancy intervene between *I* and *Thou*" (Buber 2004, p. 17). Most importantly, "The primary word *I-Thou* can be spoken only with the whole being" (Buber 2004, p. 17). This is the essence of a fully human way of being. However, vigilance is always necessary and especially so in highly technological societies, *for the development of experiencing and using comes about mostly through the decrease of an individual's power to enter into relation*. Even when relation has been fulfilled there remains the danger that the *Thou* will degenerate to an *It*.

Buber's unconventional writing style makes demands for imaginative reflection on the part of the reader. However, it provides a number of insights of value in the development of an aspirational engineering ethic. It is clear that Buber has provided a vocabulary and approach that enables a discussion of important aspects of human life. The *I-It* world would be recognised by engineers as a description of the conditions under which they commonly carry out their professional activities. Buber rightly emphasises the importance of technical knowledge and technical activities. The development of the *I-It* concept also provides an account of the unease that engineers may feel about being restricted to technical aspects alone in the course of their employment. *His description of the progressive augmentation of the world of It is a means of expressing the danger of becoming lost in the labyrinth of technology*.

Buber's description of *I-Thou* interactions has the exceptional advantage of encompassing both person/person and person/natural world (environmental) relationships. Engineers would certainly recognise *I-Thou* experiences in their interpersonal relationships and most likely in their interaction with the natural world. However, they may not have considered such *I-Thou* experiences as being part of their engineering activities. This vocabulary and approach should encourage engineers to re-evaluate their attitudes to the ethics of their professional activities. This could occur through the *I-Thou* relation providing a conceptual grounding for desirable goals. For example, the *I-Thou* concept can express concern for the individual persons affected by engineering activities, rather than the statistical concern of consequentialism and contractualism or the impersonal concern of duty. Furthermore, such a vocabulary can raise the sensitivity of engineers to the environmental consequences of their activities.

An even stronger formulation of our responsibilities has been provided by Levinas, who reverses the philosophical tradition that has seen ethics as arising initially out of self-interest by instead prioritising the demands that an other can make on us, which he designates by the strikingly visual notion of *the face*. He describes an ethical act as being defined by "a response to the being who in a face speaks to the subject and tolerates only a personal response" (Levinas 1969, p. 219). This view is based on the proximity of others generating a sensibility that leads to their needs taking priority. He even writes of the needs of others making us hostages, that we are above all responsible for others, indeed summoned to responsibility, even to the extent of substituting their needs for ours (Levinas 1981, pp. 117 and 184). Levinas does not develop his philosophical arguments in a conventional way but his message is nevertheless clear. In simple terms, and changing the metaphor, we need to hear the voice of others saying, "It's me here, please help me!" According to Levinas the individual response should be, "here I am for the others" (Levinas 1981, p. 185).

It may be considered that Buber's notion of *I-Thou* relationships demands too much for an engineering ethic. It assumes a close proximity and there is certainly a limit on the number of such relationships that an individual can maintain. However, it has been proposed that a third type of interaction, an *I-You* relationship, may be an appropriate description of many encounters in modern society (Cox 1965, p. 61), especially in modern urban life. Such an *I-You* relationship recognises the uniqueness and integrity of the person encountered but acknowledges that the interaction may be brief and lacking intimacy. There is a great variety of such relationships, but in all there is an aspiration to ensure that the person is not used in a way that leads to degeneration to an *I-It* interaction. Simply put, other people have names. In some cases reciprocity may be maintained, such as in simple commercial exchanges. In others one of the parties may make a response *beyond reciprocity*, for example in helping another in difficulty. In both cases, spatial proximity is experienced, but only for a short time.

It may be proposed that the articulation of an aspirational engineering ethic can be facilitated by extending the *I-You* vocabulary *beyond proximity*, to include a relationship with people who may be distant in place and/or distant in time. Thus, the task of the engineer may be viewed as the development of technical knowledge and technical activities, the world of *I-It*, in response to an *I-You* concern for those benefiting from the technical advance. The people affected by the activities may be located far from the place where the engineering work is conceived and planned. In some cases, they may be far from the place where the engineering artefacts are constructed or even far from the place where the completed, engineered artefacts are located. Again, people may be affected at some future time, perhaps at some distant time. Otherwise expressed, and extending Levinas' notion, the engineer must visualise *the face* of those affected by his or her activities even if they are not physically present. This visualisation of *the face* should be accompanied by the internal hearing of the voice who says, "It's me here, please help me!".

12.4 The Practice of Engineering

There has been a tendency for published accounts of engineering ethics to focus on ethical dilemmas, leading to what could be termed a "quandary" view, or even a "catastrophe" view. Alternatively, it might be proposed that the key ethical features of an individual's life are not responses to quandaries, but rather the adoption of a positive way of living the very nature of which helps to minimise the occurrence of such difficult situations. Such a virtue approach to ethics requires careful consideration in the development of an aspirational engineering ethic. A focus on virtues is certainly a way of expressing and promoting the sympathetic side of our nature, of cultivating the sensitivity envisaged by Buber and Levinas. MacIntyre (1985) has traced the historical development of the philosophical discussion of virtues. Like Buber and Levinas, he has argued that other traditional approaches have placed too little emphasis on persons, and further that such approaches also placed too little emphasis on the contexts of these persons' lives. However, there is one feature of virtue ethics that requires special attention if it is to be successfully applied: that the various proponents of this approach provide different listings and prioritisations of qualities considered to be virtues.

MacIntyre's interpretation of these differing accounts is that virtues can only be fully identified in the context of what he terms a *practice*. He gives a very specific definition of what he means by a practice:

...any coherent and complex form of socially established cooperative human activity through which goods internal to that form of activity are realised in the course of trying to achieve those standards of excellence which are appropriate to, and partially derivative of, that form of activity, with the result that human powers to achieve excellence, and human conceptions of the ends and goods involved are systematically extended. (MacIntyre 1985, p. 187)

Among his examples of a practice are the game of football, chess, architecture, farming, and the enquiries of physics, chemistry, biology and history. MacIntyre makes a distinction between *internal goods* and *external goods*. *Internal goods* need a practice for specification and can only be fully understood by participation in that practice. In the context of a game of chess these might be particular kinds of analytical skill, strategic imagination and competitive intensity. The achievement of such goods involves standards of excellence and obedience to rules. *External goods* are contingently attached to activities and could be achieved in other ways. Examples include prestige, status and money.

This analysis allows MacIntyre to postulate a new definition of virtue:

A virtue is an acquired human quality the possession and exercise of which tends to enable us to achieve those goods which are internal to practices and the lack of which effectively prevents us from achieving any such goods. (MacIntyre 1985, p. 191)

He regards such virtues as defining the relationships between people who share the purposes and standards of a practice. He further regards truthfulness, justice and courage as being prerequisite virtues for any practice. The inclusion here of courage appears at first surprising. However, it has special relevance in the present context following from the explanation, "We hold courage to be a virtue because the care and concern for individuals, communities and causes which is so crucial to so much in practices requires the existence of such a virtue" (MacIntyre 1985, p. 192).

MacIntyre draws attention to several key features of his analysis. Firstly, that a practice is more than just a set of technical skills. Secondly, that no practices can survive for an extended time unless they are sustained by *institutions*, of which he gives clubs, laboratories and universities as examples. He regards institutions as characteristically concerned with external goods. They also give practices an historical dimension. Thirdly, as is clear from the initial definition, practices have an

aspirational aspect. Their goals are subject to continuous extension. Fourthly, that if the pursuit of external good were to become dominant, the concept of the virtues would suffer attrition and even total effacement. That is, the nature of the world is such that unbridled pursuit of wealth, fame or power leads to loss of truthfulness, justice, courage and other desirable qualities.

MacIntyre considers architecture as a practice, and though engineering is not mentioned in *After Virtue* it seems clear that it fulfils the requirements of his definition. There are specific *internal goods* in the profession of engineering, in particular those associated with the accurate and rigorous application of scientific knowledge combined with imagination, reason, judgement and experience. These give personal satisfaction as well as providing a framework of excellence on which further activities can be based. The *external goods* of engineering particularly include technological artefacts. Further, considerable economic benefits are generated for the broader societies in which engineering activities take place. The various forms of *institution* that provide continuity and coherence to the practice of engineering include professional engineering associations, universities and commercial enterprises. These institutions can play a key role in promoting the aspirations of individual engineers, in *systematically extending* their practice.

Though *ends* are mentioned in the definition of a practice, it is curious that Mac-Intyre subsequently writes very little about them. This is maybe because the examples that he develops, such as chess and portrait painting, do not have ends providing substantial physical benefits to the broader community. *The end of engineering may be described as the promotion of human flourishing through contribution to material wellbeing*. Here a cautionary note should also be sounded. MacIntyre noted the dangers of too great a focus on external goods such as wealth, fame or power. In the case of engineering there is also a danger of focussing too greatly on the external goods of ingenious technological artefacts. In MacIntyre's terminology, technological artefacts should be considered as contingent products, external goods, in the pursuit of the end of human flourishing. *Hence, the present imbalanced prioritisation in engineering of technical ingenuity over helping people may be considered as arising from mistaking the external goods of the practice for the real end of the practice.*

It is also pertinent to inquire about which virtues are appropriate for the practice of engineering. MacIntyre defined virtues in terms of the enabling of achievement of goods internal to practices. In the case of engineering this definition would benefit by being broadened to include the enabling of the achievement of ends. MacIntyre has suggested that truthfulness, justice and courage are prerequisite virtues for any practice. An authoritative statement of the further virtues is given in the UK Royal Academy of Engineering's *Statement of Ethical Principles* (Royal Academy of Engineering 2007b). Though the Academy refers to them as principles, they clearly merit consideration as virtues on the understanding presented here:

Accuracy and Rigour Professional engineers have a duty to ensure that they acquire and use wisely and faithfully the knowledge that is relevant to the engineering skills needed in their work in the service of others.

Honesty and Integrity Professional engineers should adopt the highest standards of professional conduct, openness, fairness and honesty. *Respect for Life, Law and the Public* Good Professional Engineers should give due weight to all relevant law, facts and published guidance, and the wider public interest.

Responsible Leadership: Listening and Informing Professional Engineers should aspire to high standards of leadership in the exploitation and the management of technology. They hold a privileged and trusted position in society, and are expected to demonstrate that they are seeking to serve wider society and to be sensitive to public concerns.

As part of the introduction of these principles or virtues, the *Statement* contains a cogent and challenging description of what in MacIntyre's terminology might be considered *the practice of engineering*:

Professional engineers work to enhance the welfare, health and safety of all whilst paying due regard to the environment and the sustainability of resources. They have made personal and professional commitments to enhance the wellbeing of society through the exploitation of knowledge and the management of creative teams.

These principles or virtues and the description of the practice of engineering provide a key component in the development of an aspirational engineering ethic. What is most needed in addition is a more positive commitment to prioritising people, to work for the wellbeing of all *individuals* affected by engineering activities. There is a danger that consideration of the "welfare, health and safety of all" or the "wellbeing of society" can be interpreted in terms of a calculus of consequences or even a too narrowly defined contractualism. The terms "all" and "society" need to be interpreted both more specifically, in terms of persons, and also more generally, beyond the boundaries of nation states at which societies tend to draw their limits. *Such terms need to be understood as referring to both human collectivity and the human quality in each individual*. Here concepts such as those of Buber's *I-Thou* relationships, *I-You* relationships or Levinas' *face* can provide vocabularies encouraging sensitive engagement.

12.5 The Life of the Individual Engineer

MacIntyre's virtue based description of practices and institutions provides the basis for a coherent ethical description of engineering as a profession. A further issue that needs to be addressed is how ethical coherence can be achieved for an individual engineer. This is a topic needing specific attention due to the tendency for employees to bracket their personal ethical values while at work in goal- and end- oriented organisations. The adoption of a genuinely aspirational engineering ethic would be greatly facilitated if this susceptibility could be minimised. Here a simple observation is very pertinent – that a person who genuinely possesses a virtue would be expected to manifest it throughout the range of his or her activities, both professional and personal. This is a very important benefit of virtue-based approaches to ethics. In contrast, rules and duties tend to apply to rather specific sets of circumstances.

The suggestion is that we need to view our ethical lives as a unity. Such coherence of professional and personal affairs would give to each of us a greater consistency in ethical decisions. In developing such a viewpoint we can refer to the way that MacIntyre and others have drawn attention to the narrative nature of human lives. In trying to understand ourselves we imagine ourselves within a story. We do not view our lives as a series of unconnected episodes, as simply a chronology. Instead we consider the intentions, situations and history of our activities. We have a degree of authorship of our lives. We can set aims and choose directions, though we are of course subject to many unpredictable occurrences including the actions of others. The narrative in which we place ourselves gives intelligibility to our lives. Our degree of authorship also makes us accountable not just for isolated events but for our overall direction and the cumulative effect of all activities in which we take part. This approach is closely related to the ancient view of ethics as having as an aim the leading of an accomplished *life*.

A narrative view of life is recognised in everyday language. The description of someone having "lost the plot" is used to indicate loss of judgement in a given situation, usually a situation of significant importance in an individual's life. We can recognise this in our own lives and in the lives of others. Indeed, recognition of the need for and the importance of a cumulative narrative in the lives of others can provide a powerful underlying support for providing care. We can become aware of other's stories. As Ricoeur has written, "We tell stories because in the last analysis human lives need and merit being narrated. This remark takes on its full force when we refer to the necessity to save the history of the defeated and the lost" (Ricoeur 1984, p. 75).

Engineering ethics has been most frequently approached as seeking an answer to questions of the type, "What should I do?" or more specifically, "Which option should I choose?". A virtue approach to engineering ethics, with the virtues defined within the context of the professional practice of engineering, indicates a further important type of question, "What underlying professional characteristics should I cultivate as an engineer?" The challenge of considering one's life as a narrative unity suggests further questions, "Of what story am I a part and how do I wish to develop this story?" However, there is another crucial way in which the approaches differ. The question "What should I do?" can lead to a further series of investigations and questions of the type, "What are the reasons for doing...?" Due to the complexity of engineering, indeed the complexity of life, there are a myriad of such investigations and questions. In the case of consequentialism, contractualism and even, to a large extent, duty based approaches to ethics such questions will in theory have an impersonal answer. However, in practice, at some point the engineer has to make a decision, to make one of the available options his or her own. Virtue ethics in a narrative context to the greatest extent makes clear that the engineer then has to be prepared to make the statement, "I am responsible for...".

12.6 Practical Outcomes

This article has made the case for the priority of people, for the continuity and coherence provided by a practice, and narrative unity in the development of engineering ethics. As both engineering and ethics are practical, engineering ethics should be doubly expected to have practical outcomes. Such outcomes may occur at both the institutional and individual level.

Important outcomes at the institutional level suggested by the aspirational ethic outlined include:

- *In education* Recruitment of students and the overall tone of engineering courses should give greater emphasis to the goal of benefits in terms of the quality of life of individuals. Personal responsibility for the results of professional activities should be emphasised.
- *Professional associations* Professional codes of national engineering associations should progressively incorporate increased degrees of compassion and generosity. The creation of an effective international engineering organisation to promote aspirational practice for all across national boundaries would be beneficial.
- *Industry and work practices* The more widespread adoption of aspirational codes of conduct in industry should be promoted. Career development plans that bring employees into closer proximity with end-users for at least part of their working life should be encouraged.

However, the outcomes for the individual engineer are the most significant. Each and every engineer needs to take an active role in considering the ethical implications of his or her work. It is not credible to be an engineer who "does what he is told but does not know what he is doing". The special capabilities for promoting wellbeing which engineers possess bring special responsibilities. Buber noted the especially demanding and enhanced responsibility inherent in the asymmetric relationships which teachers and doctors have with their pupils and patients (Buber 2004, pp. 98–99 (Postscript)). Such an enhanced responsibility to provide care applies likewise to engineers. Engineers have a responsibility *for* those affected by their activities. Our aspiration as engineers should be to hear the voice in need which cries, "*It's me here!*" and to reply "*Here I am, how can I help you?*".

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References

- Anscombe, G.E.M. 1997. Modern moral philosophy. In Virtue ethics, eds. R. Crisp and M. Slote, 26–44. Oxford: Oxford University Press. Originally published 1958.
- Buber, M. 2004. *I and Thou*. London: Continuum. Originally published as *Ich und Du*, Berlin: Shocken Verlag, 1923.
- Cox, H. 1965. *The secular city*. London: Penguin Books. Originally published by Macmillan, New York.

Crane, A. and Matten, D. 2004. Business ethics. Oxford: Oxford University Press.

Gansler, J.S. 2003. Integrating civilian and military industry. *Issues in Science and Technology*. http://www.issues.org/19.4/updated/gansler.html. Accessed 22 May 2008. Gansler is a former US Under Secretary of Defense.

- General Medical Council. 2006. Good medical practice. London. http://www.gmc-uk.org/guidance/good_medical_practice/GMC_GMP.pdf. Accessed 22 May 2008.
- Levinas, E. 1969. *Totality and infinity*. Pittsburgh: Dudesque University Press. Originally published as *Totalité et Infini*, The Hague: Martinus Nijhoff, 1961.
- Levinas, E. 1981. Otherwise than being. Pittsburgh: Dudesque University Press. Originally published as Autrement qu'être, The Hague: Martinus Nijhoff, 1974.
- MacIntyre, A. 1985. After virtue. 2nd edition. London: Duckworth. First published 1981.
- Ricoeur, P. 1984. *Time and narrative*. Vol. 1. Chicago: University of Chicago Press. Originally published as *Temps et Récit*, Editions du Seuil, 1983.
- Royal Academy of Engineering. 2007a. Some engineering ideas for the 21st century. Contribution to the US National Academy of Engineering's Grand Challenges project. London. http://www.raeng.org.uk/policy/responses/pdf/Grand_Challenges.pdf. Accessed 22 May 2008.
- Royal Academy of Engineering. 2007b. *Statement of ethical principles*. London. http:// www.raeng.org.uk/policy/ethics/pdf/Statement_of_Ethical_Principles.pdf. Accessed 22 May 2008.
- Stocker, M. 1997. The schizophrenia of modern ethical theories. In *Virtue ethics*, eds. R. Crisp and M. Slote, 66–78. Oxford: Oxford University Press. Originally published 1976.
- UNESCO. 2003. World water development report: water for people, water for life. http:// www.unesco.org/water/wwap/wwdr1/. Accessed 22 May 2008.