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William Grimson

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Chapter 4

Engineering - An Inherently Philosophical Enterprise

William Grimson

Abstract: This chapter first sets out the arguments for considering engineering from a philosophical point of view with specific reference to the main branches of Philosophy. Additionally within the single branch of Epistemology, the relevance of Empiricism, Rationalism, Existentialism, Logical Positivist, and Post-Modernism to engineering is briefly outlined. The general proposition advanced is that Engineering is itself fundamentally philosophical in nature, attempting in its own way to make sense of the world in which we live. That translates to rejecting the notion of having a Philosophy of Engineering, against the grain it is admitted, and simply to use the concepts and tools assembled by philosophers over many centuries in order to observe and characterize Engineering. Following this train it is stated that Engineering needs to use all the insights that can be gained from Philosophy, with as many perspectives as possible, and including a consideration of Post-modernism and Deconstructuralism. The final part of the chapter in reaching some conclusions suggests that the Engineering profession, particularly through its education programmes, should harness the power of philosophy to enable engineers to be more accountable to society.

1. Introduction

That the average man or woman knows more about professions such as Medicine or Law than about Engineering is remarkable when one considers the impact of that profession on our built environment. It is perhaps the very ubiquitousness of engineering that is at the root of the problem. And it is true also that even if the products and artefacts of engineers are everywhere, the engineer, whether working as an individual or in a group, acts largely unobserved by those outside their profession. So we have a sort of paradox: the engineer as one belonging to an invisible profession but a profession that has the greatest of impacts on our world. It is thus both ambitious and appropriate then that this book has been written and this chapter takes an overview of the relevance of philosophy to engineering.

Engineering whilst it draws knowledge and inspiration from Science, Mathematics, Architecture, Art and Nature is neither simply a super- or subset of these disciplines: it has its own distinguishing features. Strangely the discipline with which Engineering can best be compared is Philosophy or at any rate a modern interpretation of what constitutes Philosophy. Adam Morton has stated that '*philosophy is one discipline among others, aiming to find truths about the relations between … its objects, in a way that requires evidence from fallible sources, including evidence pre-digested by other sciences. Philosophy is like engineering … concerned above all with topics where theory and evidence are not in perfect agreement, and where practical needs force us to consider theories which we know cannot be exactly right. We accept these imperfect theories because we need some beliefs to guide us in practical matters. So along with the theories we need rules of thumb and various kinds of models*' (Mou, 2001). This puts in a nutshell the very essence that is engineering – to proceed at all, some assumptions or approximations have to be made if 'things' are to be designed and built. And there is great art in being able to use gainfully those theories that are known to be imperfect and to judge the extent to which rules of thumb may be safely deployed.

Carl Mitcham, on reflection, has asserted that '*because of the inherently philosophical character of engineering, philosophy may actually function as a means to greater engineering self-understanding*' and taking this as a lead an increased understanding of the engineer as a global citizen (Mitcham, 1998). The same author also points out that engineers are blamed for many of the world's ills (pollution, greenhouse gases, ugly buildings etc) and notes that Martin Heidegger '*has even gone so far as to argue that all such ethical and aesthetic failures are grounded in a fundamental engineering attitude toward the world that reduces nature to resources in a dominating Gestell or enframing*'. The engineer as a global citizen needs to explain him or herself to such a charge! But they need to understand themselves first.

There are good arguments for considering engineering from a philosophical point of view with specific reference for example to Empiricism, Rationalism, Existentialism, Logical Positivist, Post-Modernism, and the Philosophy of Science. The way engineers interact together can be interpreted from a philosophical standpoint, and a similar treatment but with an external focus (e.g. dealing with engineer non-engineer relationships) can be applied to the external perception of what constitutes engineering. When taking what might be termed a holistic and philosophical perspective some conclusions can be reached that suggest that the engineering profession needs to partially realign itself away from a purely scientific base in addressing the major challenges facing humanity today. The underlying reason is that engineering is not just science – it may use science and clearly science is of huge impor-

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tance to engineering – but it is much more and needs typically to take into account a wide range of factors and aspects. So for that reason this author, at least, dislikes the use of the term ‘Engineering Science’ as it carries the suggestion that Engineering by itself does not embrace Science! Finally, as a means of communication the Engineering profession can utilize the tools of philosophy to help enhance the understanding of all citizens regarding how engineers come to their conclusions and solutions.

2. Engineering from a Philosophical Perspective

What do writers mean when they use the term Philosophy of Engineering? In this respect it is noted in the Introduction to Chapter 5 that the literature on the ‘knowledge of engineers’ has been somewhat neglected, partly because of an imagined positioning of that knowledge somewhere between craft and science. It should not be surprising then that a comprehensive Philosophy of Engineering is not in evidence. Stepping back a little, what indeed is a good working definition of philosophy? And it is noted that a current entry in *Wikipedia* states that ‘the definition of philosophy is famously a difficult matter, and indeed many definitions of philosophy begin by stating that it is famously difficult’. So how does one proceed? An engineer might attempt the sound practice of extrapolating from firmer ground and derive a definition of Philosophy of Engineering from, say, a Philosophy of Science. But this carries no guarantee of success. Consider within a Philosophy of Science Karl Popper’s often discussed falsifiability principle. Much has been written on this principle yet is would seem to some that it has no relevance to engineering. Indeed its relevance to Science might also be questioned. String theory or Super String theory is quoted by some as failing Popper’s test yet many eminent Physicists consider that String theory is a legitimate scientific activity. No example comes to mind of where an engineer would consider whether his or her theory was falsifiable: the question would not arise. Failure on the other hand is important in engineering, but is not as strong a feature of science. In engineering, requirements and constraints are gathered, analysis and design carried are out, followed by the creation of something which is totally open to the possibility of failure in some mode or other. The role that failure or partial failure plays in the development of engineering design in fact is fundamental as pointed out by Henry Petroski in much of his writing and especially in his book ‘To Engineer is Human: The Role of Failure in Successful Design’ (Petroski, 1985). In short, generalizing a Philosophy of Science to encompass Engineering is, at best, problematic.

An alternative approach to an extrapolation from a Philosophy of Science is to reject the concept of having a Philosophy of Engineering based on another domain and instead go back to the basics of Philosophy and develop a set of attributes, characteristics or even principles that collectively state something specific to engineering. Put another way, do we need to have a Philosophy of Engineering? Ludwig Wittgenstein considered that 'Philosophy is not a theory but an activity' (mental activities one assumes) so one conclusion might be that the most that one can produce from Philosophy is a set of observations. Thus a multi-faceted picture and not a single homogeneous philosophy is the likely outcome which is in keeping, perhaps, with the view expressed in Chapter 6 as to the 'polyparadigmatic inquiry' nature of engineering. One simple way of starting this observation process then is to work within the main branches of classical philosophy and to explore what they can 'say' about Engineering. What are the main branches? Perhaps there is not a total agreement on the answer amongst modern professional philosophers but historically at least the five main branches are generally agreed to be Epistemology, Metaphysics, Ethics, Logic, and Aesthetics. It is noted in passing that, to a large extent, the various Schools of Philosophy over the centuries were associated mainly with one of these branches, whereas the application to engineering of these branches must involve all five. Returning to the proposed alternative to having a Philosophy of Engineering, the contention is that by careful reflection on the totality of what constitutes engineering from the perspective of each of the above five branches, something definitive emerges about 'engineering': in effect the branches are the 'microscopes/telescopes' that are used to examine the subject. Putting it this way it becomes a little clearer that it does not make great sense to talk about the Philosophy of Engineering or the Philosophy of Agriculture for that matter. It is more a case of what the instrument that is Philosophy discovers when it 'examines' Engineering.

As an experiment a number of Professional Engineers were asked to rank the relevance of each of the above branches of philosophy to engineering, aided by a table in which simple definitions of each branch were given. What emerged generally was a high degree of agreement that all branches bar one were highly relevant to engineering, with the exception being metaphysics. In a sense this is a partial confirmation that 'philosophy' has a universal validity. Respondents noted that in the case of Epistemology the way British Engineers gained knowledge during the earlier years of the Industrial Revolution was as often as not empirically. Whereas by the end of the Revolution engineers had borrowed Rationalism from the French. The British had made the initial progress with the development of steam engines but until important theories were developed by the French and applied to new designs the engines were hopelessly inefficient. This pattern is a particular feature of engineering. From flying buttresses to the shape of man-made wings, progress was a result of shifting from empirically gained knowledge to that found by rationalism and often in a cyclical pattern: a point reinforced in Chapter 7. The difference between Engineering and other branches of human

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endeavour is that such a dualism is actually accepted and valued! There are no theological-like objections to using any form of knowledge: in fact the engineer cannot afford to take an imagined or principled-stand against evidence however it was obtained. In that respect Engineering is very like Medicine where evidence-based medicine is now much to the fore.

The Table below summarises the responses received to the simple questionnaire used to determine or estimate the degree of relevance to engineering of each of the five main branches of philosophy.

	Description	Some main questions	Categories (examples)	Relevance to Engineering
Epistemology	Process by which knowledge is gained	What is knowable? How is it acquired? Is it valid?	Rationalism and Empiricism. Logical-positivism etc.	High
Metaphysics	Study of reality that is beyond the physical	Existence of God, the soul, and the afterlife. What is existence?	Investigation into the nature of reality. Uncovering what is ultimately real.	Low
Ethics	Study of moral value, right and wrong	Placing value to personal actions, decisions, and relations	Moral theory. Virtue ethics. Religion and ethics. Applied ethics	High
Logic	Ttudy of right reasoning	Tool used to study other philosophical categories	Propositional logic and predicate calculus. Quantum logic. Temporal logic	Low in some respects High in other
Aesthetics	Study of art and beauty	What is the relationship between beauty and art? Are there objective standards? Is beauty in the eye of the beholder? Form versus function.	Aesthetics in the arts. Aesthetics in the sciences. Aesthetics in engineering (design).	High

The respondents ‘awarded’ a low rating to Metaphysics. They might consider that they are in good company as no less a person than Wittgenstein fought against Metaphysics and saw it as grammar in the clothes of science (Kenny, 2005). But is Wittgenstein’s *Tractatus Logico-Philosophicus* not metaphysical? Further, Voltaire considered that metaphysicians ‘are like dancers, who, being dressed to the greatest advantage, make a couple of bows, move through the room in the finest attitudes, display all their graces, are in perpetual motion without advancing a step, and finish at the identical point from which they set out’. Some would have that Ontology is the most fundamental branch of metaphysics in that it studies ‘existence’ and the categories and relationships, and hence determines what entities and what types of entities exist. In that conventional sense as used in Metaphysics, Ontology has probably little relevance to Engineering. However as a tool in knowledge sharing, an ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents. This definition is consistent with the usage of ontology as set-of-concept-definitions (Gruber, 2003). And clearly the relevance of set-of-concept-definitions within engineering is huge.

A few additional points can be made.

1. The highest ranking (High) was given by all respondents to Ethics. This reflects, it is believed, modern concerns with a whole range of issues, for example: global equity in relation to the provision of healthcare, in which engineering inputs are crucial (consider the provision of clean water and good sanitation); the nuclear energy debate; pollution; environmental impact; global warming, just to mention a few obvious ones.
2. Metaphysics was given the lowest ranking by all but two respondents. This is not surprising; after all many famous Philosophers gave metaphysics short shrift. And the word itself is a little off-putting; it reeks of a fusty and ancient but no longer relevant pre-occupation. But a more modern interpretation of what constitutes metaphysics might well have elicited a higher ranking.
3. Logic: clearly valued as an activity by all respondents, and responses indicated the relevance of studying different systems of logic (not just mathematical logic as might have been expected).
4. Aesthetics: here the response was somewhat muted. Half of the respondents awarded a ranking of Medium and the other half a ranking of High. Without attempting to infer too high a level of significance, nevertheless those from a Civil Engineering or Structural Engineering background were more likely to assign a High relevance ranking than those from an Electronic or Computer Engineering background. The reason is perhaps due to the more public visibility dimension to the works of the former. It might be asserted that a sister discipline such as Architecture would highly rank Aesthetics; and Civil and Structural Engineering are their first cousins!
5. Epistemology: this branch of Philosophy was given the second highest degree of relevancy to Engineering. Also, the respondents on a ‘follow-up’ dialogue were generally well acquainted with many of the sub-branches of the activity. Not surprisingly Rationalism and Empiricism were well understood! One of the defects of the sampling was the preponderance of what might be termed Professional Academic Engineers and in academia the debate between Engineer-

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ing Science and just plain Engineering is a hot topic, with epistemology being central to the debate.

A few additional words about Ethics which is well covered in Section 3 of this book. First, it is worth recording that The Institution of Civil Engineers (UK) considers that Ethics is possibly the most fully developed philosophical area in general use within the engineering community. Second, high profile cases such as the Challenger disaster contain very significant lessons as to the role of ethics in the workplace (Boisjoly, 1987). Third, the relevance of teaching Ethics to undergraduate engineering students is surely very high and Chapters 10 and 11 provide a good starting point. Finally, the whole practice of 'whistleblowing' is not without problems, not least of which is the jeopardy that the subject may find themselves in when employed in many of today's state bodies or commercial organisations. Chapters 12 and 13 deal with many of the key issues and specific reference is made to the important US *Whistleblower Protection Act* (1989) in Chapter 13.

One overall conclusion that might be drawn is that all of the branches of philosophy are relevant to 'knowing' what engineering is, what activities are involved, and the basis for its decision-making. The five branches are essentially orthogonal and can when applied together facilitate a complete characterization of engineering.

Epistemology carries great weight and has been the battle ground on which many Philosophers have waged war. As the essence of epistemology is the nature, source, and scope of knowledge a few words about this branch is justified in the context of 'looking' at engineering.

3. Epistemology

Engineers do not generally work in isolation. It follows that a means must exist by which ideas and knowledge are exchanged amongst team members. A language and a system is required, and if in addition engineers seek to learn from other teams it is to everyone's cooperative advantage if a common language and common systems are employed. But in supporting all of this there is an underlying basis which is often just assumed and not given a moment's thought by engineers. The basis is the nature and provenance of knowledge. Or in a slightly more general sense, provenance meaning both the authority associated with at least an adequate description of the knowledge <u>and</u> some workable statement as to the limitations of that knowledge. How knowledge is 'discovered', recorded, communicated to others, used, and subsequently revised is the essence of the matter. To some extent philosophy is overly concerned with the 'discovery' phase whereas for engineering the nature of how the knowledge came to be known is of much less importance than the ability to communicate and use the knowledge gainfully.

What follows is a simple mapping of what would be conventionally called theories of Epistemology and their relationship to how engineers might use such schemes. The definitions are based on those given in http://en.wikipedia.org/wiki/Epistemology.

Epistemology Theory	Engineering dimension
Empiricism	Based on experience, a result of observation, very much to the fore in engineering disciplines.
Rationalism	Ideas not derived from our experience/observation. Based on pure thought. Clearly some knowledge is Rationalist in nature but for engineer subsequent justification from experience is valued. In the strictest form, Mathematics, Computer Logic, would be a good examples, and are of direct relevance to Engineers.
Positivism	The only authentic knowledge is scientific knowledge. Engineering could never have developed based on such a narrow definition of knowledge. Planes flew before Engineers had available sound aerodynamic 'knowledge' in this sense.
Logical positivism	Also called logical empiricism, rational empiricism, and includes the Verifiable principle; its alternative (anti-logical positivism) is Popper's falsifiability principle. Engineers can work satisfactorily without considering this theory.
Idealism	What we perceive as the external world is in some way an artifice of the mind. Not held to be relevant by most engineers it is conjectured.
Existentialism	Existentialism considers that action, freedom and decision as fundamental to human existence. Underlying themes and characteristics, such as anxiety, dread, freedom. Increasingly important perspective for Engineering taking the Human into account. To a large extent Existentialism is at odds with the Western rationalist principles: it takes into account human beings' actions and interpretations however irrational they may seem.
Philosophy of Science	Hypothesis, Prediction, followed by Experimentation and supporting or denying the hypothesis. Many engineers see this as a mixture of rationalism and empiricism. Engineering both contributes to knowledge thus gained and inherits knowledge directly from the work of scientists.
Transcendental idealism	Unlike Idealism does not claim that the objects of our experiences would be in any sense *only* within our minds. Perception is *influenced* by the categories and the forms of sensation, space, and time, which we use to understand the object. This is highly relevant, surely, to what is happening at design stages where the context of end-users must be considered together with many other constraints.

It is not within the scope of this chapter to consider in depth the mapping between Epistemological theories and how engineers use them, whether implicitly or unconsciously, but some inferences can be drawn.

1. Engineering is not just Applied Science but Science is important. So the Philosophy of Science is relevant ... up to a point.
2. Mathematics for example, which is not a Science, is highly important to Engineering and hence Rationalism is relevant.
3. Observation, even when no scientific theory is being tested is of importance to Engineering and Empiricism is fundamental to how Engineers work.
4. The Human as an individual or as a set of people are of course of paramount importance: Engineering exists primarily for the purpose of providing mankind with objects and services intended for their benefit. Both Existentialism and Transcendental idealism therefore have something important to 'say' to the Engineering profession, even if these theories are not in everyday use amongst its members.

In terms of the languages of discourse amongst the Engineering community many are obvious, such as standard mathematical notation with its embedded concepts, standard ways of representing graphically electronic circuits, structural diagrams, computer languages etc. But there is a vast language used in addition that does not fall into the above categories and which is invisible to outsiders. This is probably a characteristic of a number of professions - Law and Medicine come to mind. Without suggesting that all forms of discourse be standardised it would be beneficial, it might be surmised, if deeper understanding was reached of 'what is going on' when Engineers communicate with one another in this other language. The contention here is that ideas, concepts, and terminology drawn from a range of Epistemological theories could be harnessed to deepen that understanding.

Furthermore it is in the engineering design process more than anywhere else that all of the above has its greatest impact. Design is a high form of intellectual effort in engineering and designing for engineers is a kind of balancing act. The choice and marshalling of the relevant domain knowledge, the understanding of the constraints, the selection of design approaches, deciding which technologies to use, consideration of alternatives … all of this and more is typical of 'design'. To bring this all together, the rational and irrational, the scientific and the mere opinion is the art of the Engineer. This and other related themes are picked up in Chapter 7. The key point is that Engineering uses knowledge in all its various forms and no special allegiance can be given to any one epistemological theory. This may seem a description of a type of impurity or odd mixture. But Engineering needs to have this characteristic, dealing as it does with the real world rather than some idealised one. Also, and adding to the dogmas listed in Chapter 8 in 'The Epistemology of Possession', engineers might add that Knowledge is something that in principle can be applied.

4. Post-modernism

And what of Post-modernism and its some-time associate Deconstructuralism? Do they have something relevant to say about engineering and to engineers? This is not easy to answer firstly because a clear definition of Post-modernism is elusive. Clarity of expression is not its strongest feature! For example '*if Descartes is seen as the father of modernism, then postmodernism is a variety of cultural positions which reject major features of Cartesian (or allegedly Cartesian) modern thought. Hence, views which, for example, stress the priority of the social to the individual; which reject the universalizing tendencies of philosophy; which prize irony over knowledge; and which give the irrational equal footing with the rational in our decision procedures all fall under the postmodern umbrella'*; this particular definition of post-modernism is given in http://www.filosofia.net/materiales/rec/glosaen.htm. When someone as eminent as Noam Chomsky finds the language and hence concepts of post-modernism difficult to fathom it is not unreasonable to feel somewhat suspicious or even dismissive of the 'school'. But yet there are aspects of the above definition that might well appeal to some engineers. At its very simplest, examples of what were considered irrational abound in engineering. After all it was the 'madness or irrationality' of some engineers that brought about significant progress in many aspects of the built environment. Lord Kelvin 'knew' that 'Heavier-than-air flying machines are impossible.' But irrational man did indeed make such machines fly. Scientists did not believe that radio signals could be transmitted across the Atlantic and be received. Marconi succeeded because he 'believed' it to be possible and it was only later that the science of the ionosphere justified that belief. It might however be stretching things too far to expect engineering to give equal footing to rational and irrational decision making: but there is a time and place for what some would 'view' as being irrational. George Bernard Shaw in *Maxims for Revolutionists* put it simply enough – '*The reasonable man adapts himself to the world: the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man*'. This could be taken as an argument for the inclusion, to a degree, of irrationality in the undertakings of engineers.

Another definition offers Post-modernism as "a worldview that emphasizes the existence of different worldviews and concepts of reality, rather than one 'correct or true' one. Whereas modernism emphasized a trust in the empirical scientific method, and a distrust and lack of faith in ideologies and religious beliefs that could not be tested using scientific methods; postmodernism emphasizes that a particular reality is a social construction by a particular group, community, or class of persons" (Anderson, 1990). This definition would be identified with, probably, by any engineer in charge of virtually any large project such as, for example, the building of a large hydro-scheme in a hitherto untouched and rural valley or building a nuclear power station close to a large conurbation. In these cases the various classes of persons involved most certainly have different realities and society has progressively provided more legislation for the articulation of those realities. Engineers have to and indeed do deal with these realities, sometimes much to their frustration and that of the sponsor.

A few words about deconstructuralism which has been controversial, to say the least, within academic communities. The underlying concepts are that 'truth' and 'rationality' are social constructs that depend on the 'where' and the 'when'. This does not seem to be in any way radical – provided a reasonable interpretation is allowed. It would be hard to convince an engineer or scientist that '1+2' is anything else than '3'. However engineers would generally have no difficulty in acknowledging that some 'truths' are really only opinions. What has been radical and certainly contentious is the application of deconstructuralist tools to a range of topics, to such an extent that the work of Foucault, Jacques Derrida, and others, seem like an onslaught on intellectual tradition. If Art and Literature have been the main battlefields Science has not exactly escaped. Engineering to a considerable degree has not been a target, which is odd considering its almost overwhelming impact on the world in which we live. Engineering is not Science or Applied Science; nor is it Mathematics or some other branch of rational thought. Engineering is all of these things and much more; it is complex and involves societal considerations amongst its many concerns. In its higher forms engineering is not a bricolage-like activity and good engineering should be as a result of a fine balance when all things have been taken into account including a consideration of alternatives which may be 'true' in another context or time. Post-modernism and deconstructuralism have something important to say to or about engineering and it would be enlightening if the exponents of these activities could enter into a dialogue with engineers using a somewhat more intelligible mode of expression.

5. Conclusions - Engineers: Know Thyself

The assertion in this article is that it would be advantageous to introduce Philosophy into the undergraduate engineering curriculum. Just as a study of the History of Science and Engineering can provide a bedrock of context for students - and staff in some cases too - a course in Philosophy has the potential to allow engineering students and graduates see the activities of their profession in a new light. Engineering involves the use of and contribution to knowledge over widespread domains, the logic that is used is highly disparate in nature, significant ethical considerations are inherent in most engineering endeavours, and aesthetic aspects can be fundamental to the outcome of the engineering process. Stephen Johnston, Alison Lee, and Helen McGregor, University of Technology, Sydney, Australia in a paper *Engineering as Captive Discourse* contribute a number of insights into engineering education (Johnston, 1996). One such point made expresses their 'concern that the discourse of engineering education has been dominated by the discourse of engineering science, to the virtual exclusion of other discourses which contribute importantly to the practice of engineering'. And this leads to or can lead to a de-contextualising of engineering and engineering programmes. To illustrate, the Logical Positivist A.J. Ayer could maintain that statements about ethical and aesthetic values are scientifically unverifiable and therefore meaningless. This might be a satisfactory position for some scientists but seems remarkably inappropriate from the perspective and experience of most engineers. After all the impact on the world due to the exercise of engineering for thousands of years has been so significant, that it is not so surprising that to many citizens of the world engineering has deep ethical questions to answer, which takes us back to the quotation from Martin Heidegger at the start of this Chapter. So, if Ayer was correct, then Engineering certainly should also take into account non-scientific elements! Using the tools available from that activity called 'Philosophy', engineering educators could well be advised to closely examine how it constructs its engineering programmes and to balance the scientific with the non-scientific.

Finally, engineers should be accountable to society (in both a local and global sense). And part of that accountability is the responsibility to explain how engineering carries out its function in a manner intelligible to the non-engineer. Prof Louis Bucciarelli's book *Engineering Philosophy* examines 'how the concerns of philosophers are relevant to engineering thought and practice - in negotiating tradeoffs, in diagnosing failure, in constructing adequate models and simulations, and in teaching' (Bucciarelli, 2003). Also the books by Henry Petroski certainly speak to both the expert and the layman and are inherently philosophical or reflective in nature. That Philosophical considerations are timely within the Engineering profession would hardly be disputed and the Royal Academy of Engineering (RAE) in the UK has recently published an article in which it sets the scene for a project 'the Philosophy of Engineering' (RAE, 2006). The general aim of that project is to gain a greater understanding of the nature of the engineering profession and discipline. Whilst not agreeing that there is a need to develop a Philosophy of Engineering, this author certainly agrees with the general aims of the RAE. Hopefully that project can have parallel ones in different countries, for, as this Chapter attempts to demonstrate, Philosophy, its branches, its language and 'tools' has much to offer the Engineer in

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understanding themselves and in turn to relate that understanding to the greater community.

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