Danger: Derrida at work

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The term ‘safety critical’ applies to a wide range of technologies, from car braking systems, through trains and their signalling systems, to advanced air and space technology, both civil and military. It is a rather sophisticated euphemism for ‘dangerous’; and like the word ‘safe’, it suggests the existence of some spectral but inherent property beneficial to human health that could be lost under certain conditions, but does not have to be. How far can the discourse about safety be trusted? And why are debates about risk sometimes so heated? In this paper it is proposed that ‘deconstruction’ by philosopher Jacques Derrida, can shed some light on these questions. Unsurprisingly, deconstruction cannot say much to safety engineers about the technicalities of system building. But then again questions about whether and why we continue to build and rely upon safety critical technologies are not simply technical; the language used in them is almost always politically charged.

Deconstruction

People who have been involved in an accident or ‘near miss’ incident know how hard it can be to grasp events that seem unable to avoid clichés, stereotypes, and rhetoric. Consider remarks made by a US Energy Department expert about nuclear power station site cleanup requirements. In a recent issue of Scientific American, the expert stated that it was essential to the process of assigning safety critical systems a ‘safety certificate’. The second aspect concerns the language used in explicitly political debates about the risks society should or should not accept. It is in this latter, non-specialist aspect of DERIDASC that this paper concentrates.

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a refutation of the idea that a signifier could ever have a single, objective, self-interpreting meaning. He is highly critical of philosophies that rely on certain key 'transcendental signifiers'. He even argues that the belief that the meaning of a term can be rendered unquestionable constitutes a kind of eccentricity – 'logocentricity'. Derrida argues that there is no reliable linkage between a material mark (of whatever kind) and a self-contained meaning. Signifiers are essentially 'iterable', by which he means detachable from particular contexts of utterance or 'inscription'; after all, signifiers are specifically intended for what Derrida calls 'grafting' into new contexts. New contexts of interpretation are bound to make us conscious of new associations. In the process our words gather and retain traces of meanings that we may not suspect or might hope will pass unnoticed; over longer periods, they may lose the meaning that was originally intended.\(^3\) Unable to constitute self-sufficient and freestanding units of meaning, language is haunted both by openness to further interpretation, and by 'absences', that is associations with non-explicit words. Derrida is adept at analysing the role of words in texts that do not even mention them.\(^4\)

If meaning is a function of the context of utterance (or reading), then a full 'literal' explanation of meaning becomes impossible. There is always a need to resort to either more of the same language or another 'background' language to reconstitute the lost context. For example, consider a dictionary: the meanings of words are given only by means of other words. As we descend the linguistic hierarchy we arrive at letters, which are essential asemic (without meaning). Effects of meaning arise only when we begin to combine letters to give morphemes; these effects are weak until morphemes are combined into words; they strengthen as words are combined into sentences; sentences develop still more elaborate meaning effects when combined in texts; the meaning of texts is elaborated by their social context (or the 'social text' as it is sometimes called). One can go further, and indeed Derrida does. His most famous book, *Of Grammatology*,\(^5\) contains the assertion 'Il n’y a pas de hors-texte', which in precondition for meaning, he cannot really 'call' it the meanings we experience, but contexts are always to conduct a fairly notorious critique of binaristic back down, no fundamental boundary between 'text' entiation between two truth values allows it meanings.

Derrida’s *Of Grammatology* analyses the ‘sign’ as it is conceptualised in Western thought and finds it full of contradictions. For example, ‘signifier’ is itself thought of as a concept, but could as easily be viewed as a precondition for conceptuality. A sign is said to consist of a ‘sensible’ signifier and an ‘intelligible’ signified; yet its recognition as a token requires that we discern an ideal identity in it, namely that of the letter it is supposed to be an instance of. Derrida notes that the identification of a signifier as a signifier is actually an effect of its difference from the other signifiers in the text in which it appears: as crosswords illustrate, a letter that is entirely absent can sometimes be ‘discerned’ nonetheless from the identity of the other letters. Gradually, Derrida extends this principle to encompass signified concepts. He concludes that there is no essential or necessary core of meaning encapsulated by a concept. No properties can be defined to guarantee a concept’s uniqueness, identity, self-sufficiency, and permanence. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, the author’s view is most literally (if not elegantly) illustrated, a letter that is entirely absent can sometimes be ‘discerned’ nonetheless from the identity of the other letters. Gradually, Derrida extends this principle to encompass signified concepts. He concludes that there is no essential or necessary core of meaning encapsulated by a concept. No properties can be defined to guarantee a concept’s uniqueness, identity, self-sufficiency, and permanence. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ- entiation that is a precondition for meaning. Derrida calls it ‘difference’ (whilst noting that, as it is a precondition for meaning, he cannot really ‘call’ it anything!).\(^6\) As Derrida’s argument is very complex, we will resort to a crude example here: a logic with many more truth values than ‘true’ and ‘false’. Instead, conceptuality relies on a very elusive power of differ-
this ‘excluded other’ is subtly indicated nonetheless. Derrida’s ‘antiessentialist’ view of language implies that each term of an opposition must construct its own identity in opposition to its other; the alternative is a lapse into meaningless. So according to Derrida every concept contains the trace of its opposite, and mutual contamination between opposing concepts is unavoidable. Derrida argues that logical thinking suppresses the fuzziness entailed by contamination between opposites through the construction and imposition of distinctions which when rigorously examined sometimes reveal themselves to be unintelligible. The attempt to deny complexity and mutual dependence between so-called ‘opposites’ leads us into a language of purity, of contamination, and a bizarre ‘logic of supplemenarity’ that we seem reluctant to question.

Discussing the work of Jean-Jacques Rousseau, Derrida explains the contradictions of this logic in terms of the multiple meanings embedded in the word ‘supplement’. A supplement fills a lack in something conceived of as original and rectifies its incompleteness. The ‘primary’ is often some idealised essence or object: in deconstructive jargon it is the ‘origin’, ‘centre’, or ‘presence’. Can privilege really be assigned to an ‘origin’ simply because it preceded the supplement? And if the supplement can be shown to be necessary to the origin, what does it mean to claim that the origin ‘precedes’ the supplement? For example, are origin and supplement in fact different aspects of something that precedes them both?

Derrida notes that a supplement often acts as a substitute for an origin (as a regent substitutes for a monarch or an autopilot for a pilot). In this case, the supplement can supplant the origin. From the viewpoint that privileges the origin, this supplanting is an inversion of the natural order: the supplement becomes both necessary and dangerous to the origin. In this case, dogmatism will be mobilised to try and preserve the myth of the origin’s completeness and self-sufficiency: the supplement will be denigrated as both exterior to the origin and inferior to it. By a curious contortion of modalities, the supplement is seen as contingently necessary but necessarily unnecessary. This logic suppresses the contradiction involved in an origin that both needs supplementation and does not need supplementation. It also defies the law of the excluded middle: it requires that the origin and supplement stand in opposition and yet implies a degree of sameness between them. You may have noticed that we humans like to view the ‘opposite’ sex in this way.

Derrida argues that the ‘logic of the supplement’ arises from the ‘metaphysics of presence’ in Western modes of thinking. By ‘presence’ Derrida means the dream of immediate mental access to reality or truth – understanding without recourse to mediation through representation. Signifiers can be used to conjure signifieds with extremely doubtful unity and identity (‘the moral majority’, ‘all right minded citizens’, ‘the public’, or, as Derrida likes to quip, ‘deconstruction’).

To relate this observation to safety engineering, consider the following rather cutting critique of the safety engineering profession: we believe ‘risk’ to be some sort of substance that is emitted by physical objects and processes at a rate that can be directly and objectively measured. Some of our critics have asserted that we are adherents to a ‘phlogiston theory of risk’. Derrida’s observations suggest reasons why one might delude oneself that signifiers like ‘risk’ and ‘safety’ denote some sort of ‘phlogiston’, and also why others might mistakenly think we believe this when they examine our language.

Derrida argues that resort to the logic of supplementarity in a text marks a failure of distinction that he calls an ‘undecidable’ or ‘aporia’. Such an impasse is often marked by an appeal to transcendentally signifiers – ‘rhetoric’ to you and me. The deconstructor attempts to diagnose the intractable problems hidden by the rhetoric. The first operation in the deconstruction of a binary opposition is ‘reversal’: the roles of origin and supplement are swapped; the implicit valuations in the current argument are inverted to see whether the inverse valuation might not be just as (in)valid. The second operation, known as ‘displacement’, involves looking for the mutual dependencies that hierarchical evaluations of the terms overlook. Do opposite dialectical positions conceal underlying problems of tangled intractability? Or perhaps what is being explicitly argued is not what is really at stake.

Derrida’s claims have caused controversy in the philosophical community, and his impenetrable, convoluted, and subtly humorous writing has even led to charges of fraudulence from other philosophers: but perhaps the charge of external fraud is an excuse for the internal bankruptcy. Valiant, if intemperate, attempts to refute Derrida’s views have been made by Raymond Tallis, John M. Ellis, and John Searle. Deconstructionist thinkers are not involved in a critique of language in the normal sense of that word: they recognise that in order to communicate we have no choice but to construct our thoughts in signs and transmit them by means of inscription, be it marks on surfaces or sounds in the air. The purpose of a deconstructive reading is to seek out inevitable tensions between what an author aims to reveal through the text, its structure and logic, and the associations that are grafted onto its key signifiers during their passage through the wider social context, whether the author likes it or not. Deconstruction shows that although signifiers provide a kind of ‘access’ to referents and concepts, they set limits to that ‘access’ even as they make it possible. As authors we might feel that sign systems ‘get in the way’ of the subject matter we want to capture. Derrida might prefer to say that signs initiate the creation of our ‘subject matter’ but that they never quite finish the job; therefore, a careful and open minded reader, not overly constrained by any programmatic method for reading (nothing annoys deconstructionist thinkers more than the implication, inscribed in the title of this paper,
Looking out for safety

So what sort of context can deconstruction provide for debates about risk? Opening a book on deconstructionist literary criticism, V. B. Leitch provides an elegant classical metaphor for the dilemma of proponents who debate risks. In Homer’s *Iliad*, the night before the key battle, Trojan soldiers tremble in fear at what they see as a ‘portent of Zeus of the aegis’: a passing eagle, having caught a large snake, is bitten by its struggling prey and drops it. Polydamas and Hector look on. Polydamas denies his personal authority as a soothsayer but contradictorily argues that a real soothsayer would read the portent as saying that just as the eagle harmed its prey yet failed to triumph over it, so the Trojans will harm but not defeat the Greeks on the morrow. Hector is unimpressed. He refuses to read anything into this alleged ‘sign’; but as the author notes, this is nonetheless a reading of it. Leitch summarises the dilemma facing these interpreters in the context of the risk they are about to take (fighting a battle): ‘Both interpreters tacitly agree that the sign may be meaningless. Thus any eventual meaning must be to some extent arbitraged and arbitrary … a space exists between the sign and its potential meaning. And another space opens between an assigned meaning whatever it may be and the actual reality. These two openings constitute the spaces of interpretation, the conditions under which any and all interpretation is possible. To close these gaps, to perform an interpretation, is necessarily to play the rhetorician and the prophet.”

The dialectics of risk acceptance have to be understood in terms of the shared limitation of all the protagonists – ignorance of the outcome of acceptance (or rejection). An argument about whether or not to take a risk is a messy business: it is as if the two sides in a game were to be forced to negotiate refereeing decisions in the absence of a referee. Both sides feel that the decision is urgent; both sides argue, with an inevitable degree of internal doubt and conflict, that their interpretation is the one the absent arbiter (the outcome) would impose if present. To reject a risk is not necessarily to play safe, since avoidance of a risky action sometimes leaves something or someone else at risk. Parties to the debate try to persuade by making possible outcomes ‘present’ to the thoughts of others through their descriptions of the possibilities and consequences of action and inaction; but in our descriptions, a common agreement about what is significant and what is insignificant often eludes us, as it eludes Hector and Polydamas.

Arguments can fail to persuade others, or mislead us, because the language we use to argue, in its implicit selection of what is insignificant, might be implicitly assuming what we believe we are justifying. When our arguments fail in this way, we often resort to assertions that our position is ‘rational’ (a word we rarely apply in the plural). If the language of a different viewpoint fails to explain itself, we presume it must be ‘ideology’; yet when our own language fails to persuade others we do not always draw the same conclusion. Yet every argument requires founding assumptions that cannot be explained or justified within it. The meaning assigned to the words (or symbols) we use is the most obvious example.

Now imagine you have been tasked with making an argument that a system is ‘acceptably safe’ (or, if you prefer, that it is unacceptably dangerous). You encounter an observation or a piece of evidence that does not fit the conclusion you have in view, for example a new source of risk; or perhaps the logic of your argument leads from your basic assumptions to an intermediate conclusion you find unpalatable. What do you do? The very fact that you have uncovered something ‘unpalatable’ indicates implicit assumptions about what you secretly hoped your argument would show. Do you accept the unpalatable and take a personal risk – i.e. being the messenger who is shot for bringing bad news? Or do you push the problem to the back of your mind? A natural hesitancy and uncertainty in the presence of the unexpected is liable to lead to an incoherent mixture of these different reactions; but the ‘look the other way’ option is very seductive because it entails less immediate risk to the individual. It creates no immediate fuss. How to achieve it most easily? If one can only control the meanings of words cleverly enough, or keep them imprecise and vague enough, one can attain a position in which an argument is circular or contradictory, and yet looks rational because the contradictions lie in the meanings of its terms, not in the application of accepted rules of reasoning. These contradictions can then be ‘safely’ pushed to the back of one’s mind, and one’s doubts dismissed as ‘irrelevant’; but, eventually, an accident may find us out.

No safety in words

That concern about problems of language arise in safety engineering may seem surprising. The DERIDASC project was mentioned in introductory remarks at a recent seminar given by Jacques Derrida at the University of York (28 May 2002). The audience was highly amused by the idea that deconstruction had wormed its way even into the sciences (not that safety engineering is really a ‘science’). However, since the project began, a number of professionals have expressed their concerns about interpreting safety documentation and standards; and, ironically, the philosophical concern with language can be traced back to safety problems. For instance, Wittgenstein first developed his (later abandoned) ‘picture theory’ of language and logic from a newspaper report about the investigation of a traffic accident: he read an article about a French court case in which toy cars and dolls had been used to simulate what had happened.
The prehistory of deconstruction leads back to the linguist Benjamin Lee Whorf. Whorf was among the first thinkers to develop the idea that language plays a role in fashioning our mental models of the world rather than merely embodying them. Although extreme versions of Whorf’s theory of ‘linguistic relativity’ are largely discredited today, subtler variants are still finding favour. Indeed, there is some psychological evidence that the distinctions embedded in language can determine our perceptions in subtle ways. Verbal reasoning plays an important role in problem conceptualisation and solving.

Before his turn to linguistics, Whorf trained as a chemical engineer and worked as a fire safety officer in US chemical plants between the wars. He noted that it is not easy to tell whether words simply reflect our attitudes towards hazardous objects or whether, when we innocently pick them up from others, they cause them. For example, tank workmen would treat a so-called ‘pool of water’ very lightly until informed that this ‘water’ contained poisonous residues and gave off potentially explosive methane gas. Whorf also noted that ‘empty drums’, which actually contained flammable petrol residues, attracted groups of unsuspecting pipe smokers, that is until the word ‘empty’ was suitably qualified for them.

Contemporary risk experts have also noted this use of innocuous words to describe dangerous phenomena. In The Logic of Failure, psychologist Dietrich Dörner discusses research on decisionmaking in the governance of computer simulated societies and ecologies. He notes that when our decisions lead us into a practical impasse, we sometimes take refuge in the construction of new verbal meanings. The enforced dislocation between ideals and practice is ‘rationalised’ by changes in the meanings of words. Dörner notes that the construction of meaning involves ‘conceptual integration’, and that the integration of incompatibles will lead to doublespeak. One of Dörner’s subjects, for example, having thoughtlessly committed to a freeze on military expansion and a foreign war in rapid succession, attempted to extricate himself from his predicament via the introduction of ‘voluntary conscription’.

In philosophy, there is a complex debate about the degree to which words reflect our pre-existing thoughts and attitudes or determine them; but the idea that we not only accept contradictory meanings, but impose them on others as a means of control, has been familiar to everyone since the publication of Orwell’s 1984. In safety engineering, meaning control is sometimes exercised, not exactly dictatorially, but clumsily. On 18 November 1987, a catastrophic flash fire exploded in the ticket hall of King’s Cross underground station in London, killing thirty-one people. The causal chain leading to the fatal ‘flashover’ effect began with the ignition of an agglomeration of grease, fluff, and rubbish under an escalator, probably by a discarded cigarette or match. The subsequent report criticised the management of London Underground for its complacent attitude to less harmful fires with similar causes, of which there were about twenty a year. Management had decreed that these were inevitable in such an aged underground system, and could lead only to mild smoke inhalation and minor damage. So as not to alarm travellers (and perhaps themselves), they had instructed staff to refer to such incidents as ‘smouldering’; not quite Orwellian Newspeak in action, but clearly a lesson that tight control of language does not provide control over the phenomenon described. Indeed, it may indicate a lack of control: with apologies to Shakespeare, a fire by any other name will burn as well.

**No safety in things**

Dörner suggests that when we are presented with a goal expressed in terms of a certain key term, we should not assume that we are dealing with a single problem; a little deconstruction of the key term will often reveal a bundle of underlying problems that are intertwined, perhaps viciously. At a recent safety engineering conference a delegate examined NASA’s ‘faster, better, cheaper’ initiatives, and some of the much publicised failures and disappointments NASA has recently suffered. The delegate summed up the lesson as: ‘Faster, better, cheaper? Pick any two.’ Key goals can be mutually contradictory, or a single goal might itself decompose into contradictory subgoals. In these cases the ‘conceptual integration’ involved in meaning construction leads to self-deception, double-speak, failure, and disappointment. The enthusiasm for the computerisation of airliner cockpits and flight control systems provides a good example of how this process works, and of how it tends to generate controversy.

Cockpit computerisation has been justified on the basis that most flying accidents are caused by pilot error. Nonetheless, a pilot is always retained in order to preserve safety should the computer system seem to be coping inadequately or fail. Does this make an airliner ‘safer’? The question becomes much harder to answer once we consider possible changes of human behaviour in response to the new ‘safer’ circumstances. Greater cockpit computerisation has led to incidents in which airline crews have misunderstood the autonomy of computerised control systems, and have made botched interventions with hair raising and occasionally tragic results. It has also imposed a relaxed level of involvement in flying that leaves crews ill placed to respond to sudden and unexpected demands for intervention; and the computer system provides something new for the crew to blame when they fail to discharge their responsibilities.

The dispute about ‘operator centred’ and ‘automation centred’ systems marks an impasse for those embarked upon the search for greater engineered safety in airliners. Researchers have found that early safety problems with computerised airliners arose because supposedly well accepted principles of cockpit design (e.g. that cockpit displays and controls...
should have few modes, be visually unambiguous, and provide good tactile feedback) were forgotten in the prevailing enthusiasm for computerisation. These ubiquitous principles minimised the (rhetorical) gap between what aircraft designers intended a particular control to demonstrate, and what the crew could understand by it. Brutal visual and tactile simplicity in cockpit design was highly valued. The critical and difficult question is whether the impasse is temporary; and whether in the end, requirements for ever more aircraft safety than we currently enjoy (accident rates are proverbially low) do not turn out to be implicit requirements for superbeings, be they pilots or designers, who can bring certainty to an uncertain world.

In any case, the troublesome early history of computerised airliner cockpits illustrates the disappointment engineers might encounter if they pursue ‘obvious’ goals such as ‘greater safety’ without very concrete ideas of what is meant. In this regard, Dörner quotes Bertolt Brecht’s aphorism that advocates of progress often have too low an opinion of what already exists. The original line of thought was that since aircrew error caused most accidents, handing more decisionmaking authority over to computers would reduce their incidence; but since this policy cannot be followed unilaterally with current technology, new possibilities for man–machine conflict and new forms of risk taking become possible.

Safety engineers who do not heed Dörner’s warning may be committing themselves to engineering a property into their systems that does not exist. Definitions of safety used in the engineering profession are noticeably vague. Safety is usually characterised as freedom from either ‘unacceptable’ risk or risk ‘not greater than the limit risk’; but definitions generally do not indicate the necessary and sufficient conditions determining ‘acceptability’ or ‘limit’; and in the various domains, entire standards are written on the subject of ‘acceptable’ safety. Leveson has offered a more forthright definition: ‘Safety is freedom from accidents and losses’; but is a system safe because it cannot? What might it mean to say that haunt our world.

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The concept of the ‘near miss’ incident reveals the contradiction involved in our intuitive ideas of safety. In a study of the US nuclear deterrent during the Cold War, Scott D. Sagan comments: ‘there is an irony here that we could call the Catch 22 of close calls: the more near accidents I discover, the more it could be argued that the system worked, since the incidents did not in the end lead to an accidental nuclear war.’ An empirically verifiable characterisation of safety and danger would require hindsight; the most irresponsible act, if it succeeded, would be safe; if it resulted in injury or death it would be dangerous. Such a characterisation would be tautological and thus useless as a basis for choosing a course of action. Lack of information about the outcome is precisely the reason a decision is required, and indeed what makes a decision possible. This failure of empiricism, if we are not too careful, can accidents necessarily reflect the quality of our risk management strategies. When interpreting changes in accident rates it is very difficult to explain how far they are affected by our interventions and how far they are due to processes over which we exert no control. Much of our reasoning about safety involves us in counterfactual assertions, of the form ‘if we had not done X, accident Y would have happened’; but since counterfactual statements are defined in opposition to real events, they cannot be proven or disproven. They are often difficult for non-experts to comprehend. When we consider alternative future possibilities, the unpredictable element of chance seems irreducible; yet once hindsight shows us the actual outcome it seems predetermined. What was once thought to be a matter of luck begins to look like an inevitability. When accidents occur, risk professionals are as prone as anyone to pass from optimistic ‘cheer up, maybe it’ll never happen’ attitudes to the projection of self-consciously penetrating ‘accident waiting to happen’ analyses. These studies sometimes lead to sententious (‘this must never happen again’) conclusions about preventative measures that are either disregarded as too expensive or constitute a different set of risks.

It is mistaken to think of safety as a single property that can be engineered into a system, and objectively verified to be present or absent. We engineer properties into systems to support safety goals, but the goals are a result of our initial perception that a system is dangerous. This perception is more of a projection rather than a property of the design: anything is injurious or fatal in the right (wrong?) context. ‘Inherently safe’ systems are just those for which injurious contexts are unprecedented or implausible. For the rest, we either avoid imagining the unpleasant contexts or hope that they can be endlessly evaded with cleverness. The nuclear expert quoted in the introduction used the term ‘bad karma’ to describe attitudes to nuclear sites. Belief in inherent danger (and inherent safety) is indeed a kind of superstition somewhat akin to a belief that spirits from the future haunt our world.

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lead us to the opposing mistake of idealism. Even if it does not, language requires that we talk about ‘safety’, ‘risk’, ‘likelihood’, and ‘possibility’ as metaphysically substantive, and this could lead others to mistake us for adherents to the phlogiston theory of risk; but you will find that you cannot think about safety without the notion that ‘it’ (what?) can be manipulated, reduced, increased. Safety places us in a very Derridean double bind: we are forced to use a certain form of language in order to think and talk about it, and we should recognise that this form of language implies a metaphysics that is strictly speaking nonsensical; yet to continue to refer to (and question) the element of uncertainty in our decisions, we have to represent that element metaphorically as something we can manipulate.

Indeed, it is hard to explain what unites the vast array of properties that engineers design into systems under the guise of ‘increased safety’. When abstracted from any basis in outcomes or specific properties of specific types of system, phrases like ‘intrinsic safety’ and ‘intrinsicly dangerous’ become increasingly vacuous. This may be why design engineers prefer the concrete details of system design. It is common practice to leave the job of producing safety arguments to ‘independent’ consultants. Exploring every possible context in which a system might perform any of its actions, and taking action to forestall all those that could lead to injury or death, is an intractable problem (the engineering of complex computer software is a particular problem in this regard). Thinking of ‘risk’, ‘safety’, and ‘danger’ as properties with some sort of independent existence is a mental simplification strategy that leads all too easily to category mistakes. The phantom ‘potentials’, ‘possibilities’, and ‘likelihoods’ we imagine lurking inside certain systems are all in the mind. Thinking about safety tends to bring out our metaphysical tendencies.

It seems to some that safety professionals believe they can measure and quantify these metaphysical potentials. Sociologists and cultural theorists believe this to be impossible. In our view, the difficulties of the debate derive from the fact that few would believe in the phlogiston theory of risk if questioned about it, but that everyone is using language that implies it, but the fact that we can measure the height of an object need not imply that we think there is something called ‘height’ in it. In this respect safety is no different from any other behaviour we try to engineer into a system; unfortunately, people do sometimes seem to feel it is different.

No safety in people

Risk, safety, and danger are not the only metaphysical phantoms that should not be mistaken as substantive. In constructing an argument for or against taking a particular risk, one imagines any possible counter-arguments and tries to forestall them; this has been amusingly dubbed ‘prebuttal’. The metaphysical essences that we conjure in our debates about risk include representations of people. We have already seen the stereotypes in our opening quote from a nuclear expert. Even the most rational of texts about risk seem to rely on stereotypes. Cultural theories of risk divide us into ‘hierarchists’, ‘egalitarians’, ‘individualists’, and ‘fatalists’. John Adams tells how Norman Fowler, then UK Secretary of State for Transport, was accused of being an ‘accessory to mass murder’ for his opposition to seat belt laws, by the British Medical Association no less. Adams himself has been accused (by a politician) of holding views about the matter that are ‘symbolic of a sick society’.

Stereotyping is a sure sign that a ‘rational’ argument has run out of logic. DERIDASC has examined recent research into ‘critical thinking’, which attempts to analyse textual arguments according to the principles of logical deduction. Proponents of this form of analysis encounter serious difficulties in trying to explain the difference between a proper representation of an opposing view and the so called ‘straw man fallacy’. This fallacy involves a circular justification process in which an inaccurate representation of an opposing viewpoint is constructed and ‘brilliantly’ demolished. The performance looks less scintillating if impostures in the representation of the opposing view can be identified. Postmodern authors are fond of the phrase ‘all representation is misrepresentation’. For example, I am conscious of the fact that conscious simplifications (and no doubt the unconscious blunderings) in my text do injustices to Derrida, his colleagues, his detractors, my colleagues, Charles Perrow, Mary Douglas, Aaron Wildavsky, John Adams, and others. Only readers can do something like the ‘justice’ required to identify and discount such deficiencies (it is for this very reason that Derrida has questioned the notion that a text could, or even should, have a single determinate meaning). Whilst there are greater and lesser degrees of accuracy in representations of people, in the end all representation is inaccurate: a representation is a poor substitute for what it represents; but although stereotyping of opposing views is often thought of as unjust, our examination of various texts on risk has suggested that it most often functions as a literary device to avoid the bathos involved in the repetition of familiar lessons that people still seem inclined to forget.

Let us consider an example (and thus commit an injustice). Safety professionals usually define risk in terms of two factors, ‘probability’ and ‘consequence’. Theorists who share our doubts about the phlogiston theory of risk regard the ‘probability’ factor (when expressed statistically) as the sort of phantom that takes on whatever shape ‘elites’ wish it to. In Normal Accidents, sociologist Charles Perrow argues that the consequence factor is more important. We should build only those systems that degrade gracefully, fail safely, or allow for easy and uncomplicated interventions in response to the unexpected. A safe system minimises the gap between the intentions and
expectations of its operators and the actual consequences of its behaviour. Where we can conceive of circumstances that would require urgent intervention, especially where the information presented to operators could be overwhelming or contradictory, we should consider accidents as ‘normal’ (inevitable) sociotechnical occurrences.

‘Normal accident theory’ argues that safety critical systems are dangerous because the production pressures are in conflict with safety goals. System complexity and interconnectivity make possible a huge range of system states and behaviours that cannot be foreseen or even easily recognised by operators when they occur. Tightly centralised control is imposed on these systems in order to avoid the onset of states known to be hazardous; yet, since nobody believes that centralised procedures can prevent unknown hazardous states, mechanisms for decentralised on the spot interventions are built in; but these engineered loopholes can then be used as bypasses to relieve production pressures to the detriment of safety. Managers in pursuit of production and profit are able to impose operative shortcuts, risky improvisations, and unsafe interventions upon the operators. The moral of normal accident theory is that we should not grasp at probability theory to convince ourselves that the unexpected is unlikely to occur; and we should not blame fallible human operators when it does. However, we should blame the ‘elites’ who manage the sociotechnical system; and we should be wary of the arrogant delusions of the ‘great designers’, Perrow’s term for designers who think their systems are intrinsically safe.

This stereotypical misrepresentation of elites has a curiously contradictory function in Perrow’s text. The author has an openly expressed liberal political bias: ‘The corporate and military risk takers often turn out to be surprisingly risk averse (to use the jargon of the field) when it comes to risky social experiments that might reduce poverty, dependency and crime’ his text declaims;29 but the idea that the fallibility of operators and that of elites have the same roots gives him a hard time in maintaining the myth that the blunderings of elites are incomprehensible and egregious, whereas the blunderings of operators are entirely predictable and understandable. The logic of normal accident theory is that elites should be viewed as fallible operators of complex sociotechnical systems.

Myths to die for

Can we discern Derrida’s ‘logic of supplementarity’ generating its wasteful heat in controversies about risk? Consider airliner cockpit computerisation once more. Dangerous performance deficiencies have been perceived in aircrew. The solution suggested by aircraft designers is to supplement crew skills with greater computerisation; but in the process something (overconfidence of designers?) leads to the privileging of automated decisionmaking over aircrew decisionmaking. The supplement begins to supplant. Greater cockpit computerisation was strenuously resisted by aircrew who felt that cockpits should remain pilot centred. Both views are problematic: an automation centred view is undermined by its residual dependence on a human ‘supplement’; and the pilot centred view is undermined by the human error factor in air accidents. The roles of ‘supplement’ and ‘centre’ can be exchanged. It is not easy to see which policy will cause fewer accidents. For example, the need to subordinate one form of decisionmaking to another only makes sense if there are possibilities for conflict between the two. A policy of subordination in conflict introduces possibilities for the authoritative party to override the subordinated party unsafely. Reversing origin and supplement merely creates possibilities of the ‘opposing’ form. Two myths seem to have fuelled the controversy: that of the omnipotent designer who can foresee all eventualities, and that of the pilot in perfect harmony with his aircraft. The history of aviation is replete with counterexamples to both.30

What of binary oppositions? Fortuitously, the safety/danger opposition has already been deconstructed by risk theorists who may not know much Derrida. Experts soon found that our attitudes to risk are not always consistent with the idea that safety is positive and danger negative. Even the most cautious of us will occasionally see dangers as adding spice to life. The common factor underlying our apparently inconsistent choices is the degree of personal freedom we feel we have. Our freedom is a question of access to finite resources: evidently then, my free choices could rob you of yours. If you feel that I am engaged in an activity that poses risk to you, naturally you react negatively; whereas if you are free to choose or refuse a risk, your reactions and decisions will normally be consistent (although cases where people act impulsively against their usual inclinations are particularly fascinating). The question of whether we are ‘free’ to engage in or refuse a risky act is itself an uncertain one. So many risky activities (driving, flying, using electricity, indulging in sports) are a ubiquitous part of our social inheritance. We are under social pressure to engage in many of them; yet choice is no doubt a factor. For instance, how far do you feel ‘free’ to give up, say, driving for the sake of your safety? How would it affect those close to you if you did? How would other people react? The question of our relative freedom usually only occurs to us when we either see something go wrong or cause it ourselves (for example, if we nearly suffer an accident). Confronted with the reality of the limits of our perceptions and self-control, in our helplessness we have either a tendency to appeal for action to others (the government, the...
The risk economy

If Derrida’s thinking is along the right lines, language lands us short of a clear distinction between the complex material world and the metaphysical language we adopt to abstract and simplify it. So it will never be easy for even the most hardheaded engineer to avoid confusion between the two. The metaphysical abstraction called ‘safety’, at its most abstract, is none too coherent. Yet we act according to a metaphor whose logic is that safety can be manipulated in the same way that physical quantities can. We conceptualise safety and danger as opposing ‘substances’ that can be exchanged, balanced, and traded off in processes of adaptation. What really happens is that we manipulate the physical world and (mis)represent this manipulation to ourselves metaphysically. Our thinking about risk functions with the rhythms of an economy even before we are quite sure what its units should be. Derrida’s thinking thus sheds some light on the origins of the phlogiston theory of risk and its problems.

Is this metaphor tenable? We can only make meaningful tradeoffs where we know the total potential of ‘safety’ and ‘danger’ to which we are exposed; for example, in order to make a meaningful statistical estimation of a particular outcome, we need to know how many other possible outcomes there are. Adams has drawn a distinction between ‘risk’ and ‘uncertainty’ as follows: with ‘risk’ we know the odds, but not the outcome, and with ‘uncertainty’ we do not even know the odds. Uncertainty robs us of any precise way of trading off safety and danger to achieve a balance. So we prefer to think that we do not know the odds. In deconstructing rational arguments about risk, we look for ways in which problems of meaning indicate that uncertainties are being misrepresented as calculable.

The deconstruction of a probabilistic argument in favour of a risk (most safety arguments are in some sense statistical) involves trying to make explanatory text ‘admit’ that it is an attempt to misrepresent uncertainty as calculated risk. This misrepresentation is a risk in itself. At this point our analysis links up with the theory of ‘risk compensation’. This theory argues that individuals have an inbuilt level of risk tolerance. The ruthless exploitation of ABS braking by motorists is often cited as an example. Adams uses the metaphor of the ‘risk thermostat’ to explain the theory: when we perceive that the risks to which we are exposed are below our personal tolerance level, we will tend to exploit the increased safety in this situation as a sort of capital; we will invest in more risk until we return to our tolerance level. The theory is suggestive of some sort of mental ‘economy’ of risk. If it is correct, the safety regulators’ hope of making life safer for everyone may be doomed to disappointment. It should be noted, however, that risk compensation theory is rather controversial. The theory might be taken to imply that the public’s intuitive approach to safety is irresponsible compared with the impersonal quasi scientific approaches of the safety engineering profession; but as Charles Perrow points out, this view ignores inequalities in our abilities to choose which risks we take. In DERIDASC, we are looking for evidence of risk compensation in texts and arguments rather than in behaviour.

The main difficulty in applying risk compensation theory is remaining sceptical of one’s own objectivity. Risk compensation theory implies the doubtful assumption that there is an objective definition of what a risk is. The notion of a personal risk ‘level’ implies some sort of tolerance degree marked off on an objective scale, so that people can be ranked from risk averse to risk addicted. It is presupposed not only that there is an objective definition of risk, but that we all share it; indeed, there must be a ‘quantity’ of it represented somewhere that determines our behaviour. The concept of the risk thermostat is a ‘transcendental signified’ with a vengeance; but how far are observations of the frequency of accidents suffered by individuals sufficient to distinguish between a state of risk addiction and bad luck? And sometimes our individual notions of risk seem incommensurable and negotiations are fraught.

The status as ‘risks’ of events that could have no benefit to anyone (for example possible causes of human extinction) is not controversial; but risk assessment nearly always involves us in the weighing of costs against benefits. People do not always agree on whether something is a cost or a benefit; and in any argument in favour of (ex)changing the actual for the sake of the possible there is usually someone who feels they will lose out. In what we call risk deferral, a cost is paid now for the sake of the benefits that it could bring in the future. In ‘expenditure’, benefits that may bring costs in the future are enjoyed now. That a benefit to someone else can seem a cost to oneself (and vice versa) leaves us with the problem of how to decide whether a risk is of the first or second kind. The word ‘may’ brings us even more problems. Future developments can overturn faith in our own attributions of cost and benefit to the various activities we engage in (for example, some smokers sue tobacco companies after getting lung cancer). Psychologists working on ‘cognitive dissonance theory’ have noticed how people tend to ‘reverse engineer’ their concepts of cost and benefit in order to minimise discordance between their ideals and the consequences of their decisions. In DERIDASC, we take an interest in this (somewhat un-Derridean) psychological theory because attributions of cost and benefit...
determine whether a particular risk appears acceptable or unacceptable; one can try to deconstruct these attributions by reversing them in a game of devil’s advocate. After all, to ask whether one should take a risk or not is really to ask whether taking the risk would be a cost or a benefit. A key determinant is what investment the proposer of the argument makes in their favoured outcome. We hypothesise that everyone in the economy of risk, even other authors who share the same postmodern perspective, is keen to promote their own interests once they have deconstructed the interests of others.

The risks in refusing risks

The rhetorical temperature in debates about risk is often high. The terms of reference for the 1992 Royal Society report Risk: Analysis, Perception and Management stated that its committee members should ‘… consider and help to bridge the gap between what is stated to be scientific and capable of being measured, and the way in which public opinion gauges risks and makes decisions’. Note the ‘deconstructible’ opposition here: there is an implied privileging of the ‘scientific and measurable’ over ‘the way in which public opinion gauges risks’. Or is there? No doubt the prioritisation could be reversed. This ambiguity caused so many internal disputes that the final report, being full of contradictory statements, was not issued as a considered representation of the views of the Royal Society as a whole, but rather as a collection of miscellaneous contributions. For example, in a chapter entitled ‘Estimating engineering risk’ a group of safety engineering professionals argue that risk must be expressed as a measurable attribute in order to give engineers an objective to satisfy (chapter 2, p. 26); but in the chapter on ‘Risk perception’ a variety of authors from other disciplines (sociology, political economics, cultural theory) state that the distinction between objective and subjective risk assessment is unsustainable (chapter 5, p. 89). John Adams reviews the confusion with a mixture of amusement, bemusement, and sympathy. The pattern of this intractable wrangle repeated itself in the polarised reactions of readers of the report. In a followup text, Accident and Design, some of the protagonists continue the debate, but with little sign of convergence.

On the one hand, risk assessment professionals assume that subjective biases have to be avoided. They choose scientific terms, precise metrics, and draw on existing engineering language for constructing their models of risk. Technical safety engineering involves the production of computer simulations, mathematical models, quasi scientific documents, and a large amount of painstakingly dull ‘box ticking’ bureaucracy. The representations of risks used tend to exclude non-experts from detailed involvement.

On the other hand, cultural theorists argue that subjective biases cannot be avoided. Risk assessment professionals are attacked for their blindness to the inevitability of bringing to bear cultural biases where decisions have to be taken in conditions of uncertainty. It is claimed that ‘technocrats’ attempt to shelter themselves from open debate about ethical and political issues behind quasi scientific language. Calculative algorithmic criteria for risk acceptance are attractive to technocrats because they promise absolution from personal responsibility for the choices ‘dictated’ by the calculations; but it is argued that no means of risk construction can be culturally neutral. In summary, the risk assessment profession is charged with misrepresenting uncertainty as calculated risk.

Risk and Culture by Mary Douglas and Aaron Wildavsky is a classic text in this genre. Its authors argue that ‘It is a travesty of rational thought to pretend that it is best to take value-free decisions in matters of life and death.’ They claim that arguments about risk are really arguments about different cultural values. For example, the authors interpret sectarian aversion to environmental risk as a disguised critique of the existing ‘hierarchical’ (bureaucratic) and ‘individualist’ (entrepreneurial) institutions. They state that ‘the real choices that lead most directly to dangerous decisions are choices about social institutions … The upshot of our whole argument is that we should listen to the plaint against institutions. Instead of being distracted by dubious calculations, we should focus our analysis just there, on what is wrong with the state of society.’

The risk assessment profession is accused of imposing its own prejudices under a pretence of objective rationalism: ‘The risk assessors offer an objective analysis. We know that it is not objective so long as they are dealing with uncertainties and operating on big guesses. They slide their personal biases into the calculations unobserved. The expert pretends to derive statements about what ought to be from statements about what is. The individual tends to start from ought and so does not subscribe to the ancient fallacy’ (p. 80). Paradoxically these ‘pretensions to objectivity’ seem all too evident to the authors; in that case, what is their problem?

That there is something ‘wrong’ with the state of society implies a gap between the way society is and the way it ought to be – a cultural bias. Indeed, the authors recognise that a theory postulating that there are no objective and culture free methods for risk selection and prioritisation must be culturally biased itself. The penultimate sentence of the book is an exhortation to the reader: ‘Since we do not know what risks we incur, our responsibility is to create resilience in our institutions.’ In the final sentence, the authors declare their own cultural biases: ‘By choosing resilience, which depends on some degree of trust in our institutions, we betray our bias toward the center.’ The term ‘center’ refers to the hierarchical and individualistic (enterprise capitalist) forms of social organisation described in the fifth chapter of the book. The title of that chapter is ‘The center is complacent’. How does this alliance with complacency ‘listen’ to the ‘plaint against social institutions’?
Presumably, listening to the plaint against institutions means more than free expression. The authors want institutional change. Change implies institutional destabilisation in the short term for ‘resilience’ in the longer term, a short term cost that will hopefully bring long term benefits. In other words, the authors are asking beneficiaries of the ‘center’ to set their immediate benefits at risk; to defer some of their current risk expenditure.

The question is why institutions that acknowledge their subjectivity and cultural biases should be more ‘resilient’ than those that subsist on ‘pretences to objectivity’. In their closing sentence the authors say they ‘betray’ a bias toward the center. What does this mean? A ‘betrayal’ of a bias only has to reveal it as a bias. The bias becomes unworthy of acceptance as a truth and its subversion is initiated. Yet after laying a charge of institutional precariousness to motivate more resilient institutions, the authors make a positive gesture of identification with those whose ‘biases’ they have just subverted.

We have found this contradictory double gesture (as Derrida might call it) to be implicit in many arguments that try to persuade others to become or remain involved in enterprises that pose risks to them. Note how one cannot tell whether the gesture is subversive or supportive: Douglas and Wildavsky attempt to characterise their text as a gesture of support for the ‘center’ disguised as its subversion; but it could just as easily be viewed as a gesture of subversion disguised as support. To make the distinction, one needs to know what the proposers would risk were their proposal to be accepted. When one invests personally in a risk, it focuses the mind wonderfully.

In conclusion

Our first attempt at deconstruction looked at the ‘probability’ and ‘consequence’ definition of risk mentioned earlier. In safety cases these factors are expressed respectively as a probability and a number of fatalities/injuries. They are normally assumed to be independent variables. We quickly realised that this assumption of independence omits what should have been an obvious possibility: that the severity of an accident can affect our willingness to (continue to) accept a risk, and thus retroactively determine the likelihood of the accident. Indeed Adams has noted that the attempt to analyse risks in a rational manner leads into an intellectual tail chase: we measure risk in order to communicate it so that people will change their behaviour to reduce it; and risk compensation may defeat this goal.

Professional safety engineers should be made more aware of the trap posed by the abstraction in much language about safety matters. Technical terms are an essential tool in engineering; but in conversations about their work engineers use technical terms only as much as is needed to meet the technical needs at hand. Adams tells how after the Challenger space shuttle disaster enquiry, one investigator, the famous physicist Richard Feynman, commented: ‘If a guy tells me the probability of failure is 1 in 10², I know he’s full of crap.’ Feynman was unimpressed by risk assessors because they had become so detached from the realities of everyday safety engineering to which their words were supposedly relevant. The mere use of technical language does not prove any involved understanding of the activities described.

Ironically, our excursion into postmodernism and its consideration of the insecurities of meaning has led us to very modernist conclusions about the importance of plain speaking in safety arguments. The key problem is whether some of our technical language is somehow incommensurable with everyday language, and thus not fully explicable to the lay public. Safety engineers seem to believe in the existence of a ‘language barrier’. For example, when pressed by journalists for an opinion about the initiation of the DERIDASC project, a nuclear expert commented that nuclear safety cases were ‘very, very technical documents’. This statement is no doubt true enough: but what does it portend from a lay viewpoint? Our eventual failure to understand nuclear safety cases? A gesture of relief given the obvious impotence of our proposed method of scrutiny? If the former, we appreciate the dilemma: the logic of our argument has been that the relationship between signifiers and meanings is a fickle one, and no doubt many nuclear experts responsible for public communication by now feel that whatever they say, those with antinuclear leanings will eventually find a way to turn their words against them.

A language barrier serves to define groups of experts as socially distinct; but this alleged barrier is not respected within the mind of the individual expert, who is, after all, also a member of the public. Education, because it involves articulating technical terms into simpler language, proves both that language barriers exist and that experts can transgress them when the need arises. Hence, before taking shelter inside our technical language, safety professionals should first check to see whether it is not safer outside.

Acknowledgements

The author would like to thank the UK Engineering and Physical Sciences Research Council for funding the work discussed here under project GR/R65527/01. He would also like to thank his colleagues Professor Tom Anderson, Professor John Dobson, and Dr Stephen Paynter for their patient reading and for lively (and ongoing) discussions.

Notes and literature cited

Nonetheless, the ‘prophetic gap’ has always operated complete a PhD in software engineering at Brighton and Hove Polytechnic, which was awarded in 1991. His first postgraduate studies were at the University of Newcastle upon Tyne NE1 7RU.

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