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Technology and Prognostic Predicaments

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Abstract: As societies become increasingly technologised, the need for careful and critical assessment rises. However, attempts to assess or normatively evaluate technological development invariably meet with an antinomy: both structurally and historically, technologies display multistable possibilities regarding uses, effects, side effects and other outcomes. Philosophers, usually expected to play applied ethics roles, often come to the scene after these effects are known. But others who participate at the research and development stages find even more difficulties with prognosis. Recent work on 'revenge' effects (Tenner) and negative side effects (Kevles) are examined, as well as several cases of philosophers in 'R&D' roles. After sketching the antinomy, I outline a heuristic pragmatics of prognosis that addresses this quandary.

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1. Introduction

Imagine the following photograph: in it are two adolescent Amish girls, clad in the traditional garments with bonnets, dark dresses long and laced, but wearing *roller blades* (in-line skates) while skating along a small town sidewalk in Pennsylvania. This photograph has been publicised by the *New York Times* and other media recently. For the larger public, the response is likely to be one of a sense of incongruity between the traditions of horse and buggy, non-use of electricity, 'plain clothing' and yet – roller blades as the latest, highest tech skates, equally popular among the lycra-clad, brassiere-showing urban youth in Central Park.

What the photograph does not reveal, however, is the process behind the Amish acceptance of this technology. As a colleague once pointed out to me, the Amish – in spite of the very technologically conservative approach taken by this religious community – have probably one of the most sophisticated and effective forms of *technology assessment* available. Every new technology is considered with strict considerations about whether or not it will support or enhance the values of that community, or detract from or erode those values. Thus, not everything – indeed not

much – is accepted from the glut of current innovation that virtually immediately pervades the larger American or other industrially 'advanced' societies. The roller blade, it turns out, plays the same role for the Amish as the little red wagon, the scooter, or other forms of human-powered entertainment. It can fit, it would seem, into the 'plain' lifestyle of the Amish community in spite of its apparent incongruity for the rest of us. Electricity, television and cinema, and most other hi-tech technologies, remain excluded. I would only add that the technological conservatism of the Amish is not because of an anti-technological attitude, it is because of its deeply held (and conservative) religious beliefs.

I do not know if this community decision was a form of political compromise allowing Amish youth something new or not. It is known that many youth leave Amish society, yet the Amish have also expanded into areas from Ohio to upstate New York, beyond their previous boundaries as well. The tensions among the Amish are not dissimilar to the break-up of Eastern European Socialist countries in face of the onslaught of Western technological entertainment and consumer technologies that became so desirable, but unattainable or unaffordable in those societies.

The point of this vignette, however, is not to contrast hyper-consumerism and technological saturation with a religious form of minimalist nostalgia and communitarian values. I am using it, rather, as a hyperbolic indicator of a problem philosophers face with respect to changing technologies and the evaluation thereof. The typical role many think the philosopher ought to follow is that of 'ethician' or the reflector upon normative aspects of technologies within societies. How *ought* we to deal with technologies? What will their effects be?

I do this because, from both within my own trajectory in the philosophy of technology, and increasingly from the recognition of other philosophers and historians of technology, there emerges a practical *antinomy* with respect to precisely the predictive problems in technological development.

2. The Philosopher's Prognostic Antinomy

The antinomy can be stated simply: if philosophers are to take any normative role concerning new technologies, they will find from both within the structure of technologies as such, and compounded historically by unexpected uses and unintended consequences, that technologies virtually always exceed or veer away from 'intended' design. How, then, can any normative or prognostic role be possible?

Philosophers, typically, are expected to play post-development normative roles (as 'ethicians' in applied ethics, for example). This usual role I shall call the 'Hemingway role'. That is, as Ernest Hemingway reflected his experience in *For Whom the Bell Tolls*, his job in wartime was in the ambulance corps. He did get into the battlefield, he was actually wounded, but his task was to pick up the casualties. He was part of the battlefield 'clean-up squad'.

This metaphor is appropriate for the many applied ethics roles occupied today by many philosophers. These began at first in the context of the development of medical therapeutic technologies – for example, during the early days of kidney dialysis, at first scarce and expensive, philosophers, theologians and other non-medical personnel were called upon as a 'civilian ambulance corps' to deal with the ethical problems.

Much of this relates to 'lifeboat ethics' of scarcity situations and concerned decisions about who should get the limited treatment. The reason why the 'Hemingway role' fits is that the Spanish Civil War ambulance corps, together with the nursing staff, had to practise *triage* on the spot: (a) who was dead or could not survive? (b) who was possibly recoverable or likely to live? (c) and who was borderline and questionable for recovery or life? Depending on the severity of the battle, the borderlines for triage could shift upwards or downwards.

I do not wish to discount the importance of the 'Hemingway Role' – or of applied ethics. These are clearly an improvement over the pre-modern form of clean-up process. After a medieval battle, and only after, did the clean-up squad arrive. Then, sometimes after stripping the dead and dying, the injured could be moved and cared for. Not only was the chance for recovery lower, but the wounded had to remain on the field, bleeding, until the battle was over.

But in both cases the metaphor points to the end-game role always played by the ambulance corps. The therapy and healing roles they played remained absent from the strategy rooms of the officers and military commanders, and further still from the political considerations which always lie behind, before, and in the occurrence of war itself. For applied ethics in this context, it is always after the technologies are in place that the ambulance corps arrives.

I have argued on numerous occasions that if the philosopher is to play a more important role it must not be only in or limited to the 'Hemingway role'. Rather, it should take place in the equivalent of the officers' strategy meeting, before the battle takes shape. I will call this the 'R&D role'.

A first response to this proposal might well be: but who wants any philosophers amongst the generals? The research and development team? The science policy boards? (The implication is, of course, that philosophers will simply 'gum up the works'. And the excuse will be (a) that philosophers are not technical experts, and (b) any normative considerations this early will certainly slow things down – a sort of 'Amish effect'. Of course, the objections, in turn, imply the continuance of a status quo amongst the technocrats as well, free to develop anything whatsoever and free from reflective considerations.)

It should therefore be noted initially that the antinomy I am pointing to arises primarily for 'R&D role' placed philosophers. There is an advantage to be had from having to deal with already extant problems in the 'Hemingway role' position.

But, first, permit me to sharpen the antinomy: in my own work I have argued that *all technologies display ambiguous, multistable possibilities*. Contrarily, in both structure and history, technologies simply can't be reduced to *designed functions*. I have claimed that there is a 'designer fallacy', which functions similarly to the 'intentional fallacy' in literature. That is, if the meaning of a literary work cannot be traced or limited to the author's intent, similarly, in technology, its use, function and effect cannot and often does not reduce to designed intent.

Heidegger's hammer is a simple example: a hammer is 'designed' to do certain things – drive nails into the shoemaker's shoe, or into shingles on my shed, or to nail down a floor – but the design cannot prevent a hammer from (a) becoming an objet d'art, (b) a murder weapon, (c) a paperweight, etc. Heidegger's insight was to have seen that an instrument *is what it does, and this in a context of assignments*. But he did not elaborate upon the multistable uses *any* technology can fall into with

associated shifts in the complexes of 'assignments' as well. No technology is 'one thing', nor is it incapable of belonging to multiple contexts.

The same obtains with complex technologies: email in my university was first used to transmit memoranda, then as a substitute for 'phone tag', then even for chain letters (which the administration tries hard to prevent) and even the propagation of computer viruses. And, as Kittler has well shown, the typewriter (and one can add, the telephone) was originally designed as a prosthetic device to help persons with sight deficiencies (or the telephone as a sort of hearing aid) – uses that became at most marginal as the office soon transformed the secretariat through the typewriter and communications through the telephone (Kittler, 1989: 105–207).

I argue that the very structure of technologies is multistable, with respect to uses, to cultural embeddedness, and to politics as well. Multistability is not the same as 'neutrality'. Within multistability there lie *trajectories* – not just any trajectory, but partially determined trajectories. Optics takes us into the micro- and macroscopic as the histories of telescopes and microscopes evidences, but optics remains within the boundaries of the light spectrum and did not, by itself, develop into the new astronomy, which now ranges from the gamma ray short waves into the radio wave long waves, thus revealing a wider world. Similarly, the external fulfilled intentionality of a Moon mountain scene carries with it not only the magnification of this external phenomenon, but it magnifies the motion of the observer holding the telescope and thus reflexively opens the way to a discovery of bodily micro-motion – a trajectory not developed by Galileo but implicit within his favoured instrument.

These complexities of multistability clearly make prognosis difficult, perhaps impossible if the aim is full prognosis. These are multiple intrinsic possibilities of the technologies. Historians of technology, however, tend to focus upon *effects*, and here there are two books to which I will refer, which make the case brilliantly for the unforeseen and unintended uses, consequences and side effects that *all* technologies produce.

The first book is *Why Things Bite Back: Technology and the Revenge of Unintended Consequences* (1996) by Edward Tenner. I do not have the time to outline in detail all the forms of a 'revenge theory' of technological consequence – which include differences between *rearranging, repeating, recomplicating, regenerating, and recongesting effects* (Tenner, 1996: 8–9). But the book is glutted with examples of each. His project began by reflecting upon a prediction made by 'futurologist' Alvin Toffler, concerning the coming of electronic media. Toffler says, 'making paper copies of anything is a primitive use of [electronic] machines and violates their very spirit' (Tenner, 1996: ix). Obviously, we are all aware of the 'paperless' electronic society we now inhabit! Tenner claims,

> 'Networking had actually multiplied paper use. When branches of Staples and OfficeMax opened near Princeton, the first items in the customer's view ... were five-thousand sheet cases of paper for photocopiers, laser printers, and fax machines' (Tenner, 1996: ix).

I shall not even attempt to list the multiple examples of these revenge effects – two simple ones illustrate how a single technology, which necessarily belongs to a context of assignments, produces unintended and often revenge side effects:

- 'At home ... cheaper security systems are flooding police with false alarms, half of them caused by user errors. In Philadelphia, only 3000 of 157,000 calls

from automatic security systems over three years were real; by diverting the full-time equivalent of 58 police officers for useless calls, the systems may have promoted crime elsewhere' (Tenner, 1996: 7). (In my own village on Long Island, the situation is bad enough that the Trustees are considering fines for each false alarm.)

- Another example cited by Tenner comes from the well-known phenomenon where temperatures in cities are always higher than the countryside, at first due to pavement, stone and concrete, which retain heat – but then 'improved' by air conditioning, which shifts interior heat to the exterior. Air- conditioned subway cars spill heat upon the platforms, which are often 10–15 degrees hotter, so that a ten-minute wait for a ten-minute ride actually produces a heat gain to the rider!
- A final familiar example comes from the change of composition technologies – 'repetitive strain syndrome' and carpal tunnel syndrome were rarely known in the days of the typewriter, but have escalated with the computer. The harder and slower strike of the former yielded to the faster, lighter 'advance' of the latter and contributes to this contemporary ailment.

We now have enough examples to clarify the antinomy: technologies 'contain' multiple possibilities for use, direction and trajectory – are essentially multistable – making clear prediction of effect, use and outcome difficult if not impossible. And, once in place, technologies produce in the context of the multiple assignments to which they belong unintended and often 'revenge' effects, again difficult, if not impossible to predict.

The second book I wish to cite is *Naked to the Bone* (1997) by Bettyann Kevles, a history of medical imaging. Here, the unintended side effects arise from precisely what was discovered to be – only subsequently designed to be – a medical technology that finally revealed bodies as transparent. The history of the X-ray begins this process: Röntgen's discovery was publicised through his distribution of an X-ray photograph of his wife's hand-with-ring, showing bone structure under and inside the flesh. This technology, begun in 1896, was one of the fastest to acceptance of any process. But to obtain the images long exposures were first necessary – up to 70 minutes in some cases. Retrospectively, we now know the result: severe radiation damage.

This was not knowledge that occurred immediately – indeed, one of the early uses of the X-ray was deliberate exposure to treat acne and skin disorders under long exposure time! Yet, by 1911, documented cases of burns, cancers and even deaths had accumulated. By 1920, in the incident cited by reviewers and which I repeat here, 'At a meeting of radiologists in 1920, the menu featured chicken – a major faux pas because almost every one at the table was missing at least one hand and could not cut the meat' (Kevles, 1997: 48). The history of the very instruments that make 'non-intervention' possible for exploring the body, but which cause side effects through the examination, continues to the present. This, too, is part of the unpredicted revenge effect.

This double-dimensioned prognostic problem is, I am arguing, more of a problem for persons playing roles in relation to prognosis – in our case, the 'R&D role' philosopher.

3. Philosophers in the 'R&D' Position

The antinomy clearly points to the difficulties of any normative, prognostic role. But before I make suggestions concerning how to lower these difficulties, let us take a look at a few historical examples of 'R&D role' philosophical attempts. Interestingly, the examples I will cite do not primarily belong to normative activity, but rather to *epistemological* aspects of technological development.

They are, however, suggestive of a positive role for the 'R&D' philosopher: The most sustained example of the 'R&D role' is exemplified primarily in the case of Hubert Dreyfus (he is not alone, but I shall use him as exemplar): in the early days of AI (artificial intelligence), Dreyfus was called in as a *consultant* by the RAND corporation to analyse and critique the development of AI programs precisely because they were failing to deliver either as fast or as effectively as the proponents predicted. The result was an *epistemologically scathing* critique of the program, *Alchemy and Artificial Intelligence* (1967), followed by several edi-tions of *What Computers Can't Do* (1972, 1993). At the core of the critique were *epistemological* considerations concerning how human bodies work in intelligent behaviour. While many took Dreyfus as enemy, later on second- and third-generation computer designers began to see the alternative model Dreyfus pro-posed as positive (among these, T. Winograd's 'ontological design' programs in particular). And these results have now spread to a much wider front, evid-enced in a very recent article in *Science* on 'The Space Around Us', in which Italian neuroscientists have adopted 'motor intentionalities' from Husserl and Merleau-Ponty into cognitive science (*Science*, 11 July 1997: 190). This example not only is an exception to the applied ethics role usually expected, but is also an example of a philosophical insight being incorporated into both science and technology developments.

The second example comes from observations I have been able to make while 'Euro-commuting' the last few years to northern European technical universities. I have come to know a number of philosophers located in these polytechs – they are often lonely in the sense that often there are no philosophy departments as such, although in some cases there are 'applied philosophy departments'. These philosophers, however, often find themselves on interdisciplinary research teams and play precisely 'R&D' roles. My visiting role is frequently a secondary one: I am asked to review research proposals and give advice and criticism. Examples of such programs have included 'Herman the Bull', a genetically engineered bull who has human genetic components designed to lower lactose allergies for humans who drink milk, to the 'hermeneutics of crisis' in medical instrumental displays wherein reading multiple instruments itself may determine a crisis. Here are philosophers (indirectly myself as consultant) engaged in situ at developmental stages. I applaud both these directions with respect to the 'R&D role' I am advocating. But my examples are not primarily normative, and the prognostic aims are minimal.

Even these examples hide failures of prediction: Dreyfus, in effect, predicted that 'Big Blue' could not have been developed, and contrary to my own expectations about 'what can be done, will be done'. 'Herman the Bull' has been put to pasture 'without issue', as the legal profession might put it. But we have now seen how philosophers have entered 'R&D' positions.

4. Prognostic Pragmatics

The antinomy remains: both structurally and historically, technologies present us with multistable ambiguities that exceed the bounds of rational and even prudential prognosis. Yet, to leave the situation simply there is not only to invite a laissez faire technological politics, but also to rule out even the possibility of critical reflection.

I shall here, instead, begin to outline a set of *prognostic pragmatics* that could serve, minimally, heuristic purposes:

- If technologies embody, both structurally and historically, the possibilities of multiple uses and unintended side effects, and all instantiate these in particular fashions, then one exclusionary rule for prognosis can be advised: *avoid ideological (utopian and dystopian) conclusions.* A utopian version of this, cited by Tenner, is John von Neumann's 1955 'prediction of energy too cheap to meter by 1980' (Tenner, 1996: xi). A far less grandiose version occurred when philosopher of science, Isaac Levi, assured me that while he admitted that X-rays turned out to have harmful side effects, sonograms were bound to be totally harmless. Not more than a few months after this, I sent him a clipping about a study in Japan which indicated that frequently repeated sonograms seem to affect the central nervous systems of fetuses. Similarly, dystopian predictions include the worries of the nineteenth century over health effects of train travel –presumably so fast that it would cause heart problems. The 'prediction' of side effects is not in itself dystopian, but pragmatically based upon long histories of similar side effects from all and any bodily intrusion – including non-radioactive ones. This is a generalised caution based both upon knowledge of the ambiguous structure of technologies and upon the related histories of similar instrumentation. In Kevles' history of medical imaging, it becomes clear that awareness of side effects has been amplified and that they are expected by today's practitioners. *No technologies are neutral, and all may be expected to have some negative (as well as positive) side effects.*
- From within the expectation that there will be side effects, a pragmatic caution might be: *if any negative effects begin to appear, amplify these and investigate immediately, err on the side of early caution.* In the X-ray case, skin burns were recognised very early, but techniques in shortening exposure time were slow in coming. It was also known that lead shielding prevented X-ray penetration, but shields for technicians were slow in coming. Similarly, King James (of 'Bible fame') had already noted the noxious and negative health effects of tobacco in the 1600s – and we still do not have a safety standard for same.
- Technologies, unlike searches for theories of everything in science, thrive on alternative developments. *Enhance alternatives through multiple trajectories.* Here, energy production is a good negative example: R&D going into non-nuclear and non-fossil fuels has been scanty. In spite of this, solar development has become much more sophisticated and is finding wider uses – were R&D dollars deliberately directed towards a multi-source base, we might find more promising outcomes. (In a forthcoming book, I demonstrate how contemporary sciences have increased breakthrough discoveries by the deliberate development and use of multivariant instruments. This 'postmodern' multiperspectivalism in instrumentation has implications for technologies as well.)

- Design use experiments with non-expert and different users. The unexpected uses – both negatively and positively – of the Internet are interesting in this context. Negatively, our son's soccer coach from Vermont this summer was caught in a net sting as a paedophile; positively, we found a rather idyllic isolated ranch run on solar and cellular power through a travel page on the net. The net, interestingly, has displayed a respect in which dealing with technological prognosis is very like dealing with pornographic issues – that is, issues of freedom of expression, but related to idiosyncratic attractants, makes it extremely difficult to evaluate.

These heuristic suggestions are clearly not meant to be exhaustive. They are, at best, suggestive. Moreover, they more guide one in terms of what parameters to expect, but cannot determine particulars – but this problem is no worse, or better, than any other form of prognostic activity. They do imply that (a) we need to have a deep insight into both technological structure and the history of technologies – best based on broad and interdisciplinary knowledge; (b) that a critical take is called for, neither detracted by utopian nor dystopian aims; and (c) that multiple variant approaches are likely to be the most promising for contemporary complexities. And, it is my suggestion that philosophers seek precisely those situations that allow the expansion of the 'R&D role'.

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