(male secretaries often refused to adopt to this 'machine' which they thought deskilled their handwork, but young women, seeking both a public role and pre-skilled with keyboard or piano skills, easily found a new role)! (Kittler, 1990) The designer fallacy also plays a role in Langdon Winner's best-known story, "Do artifacts have politics?" (1986). This article traces the history of Robert Moses' designs for the bridges over the parkways of Long Island. Winner claims that Moses' ulterior intention was to keep the lower classes and races out of Long Island's pristine growing suburbs. Thus he deliberately designed low bridges which would prevent large trucks and double decker buses from using the parkways. In one sense, there was some success with this material strategy if one looks at the demographics of the early 20th century – but a counter-strategy defeated whatever politics were first employed. The Eisenhower Interstate development of the 1950s called for all interstate highways to have high bridges so that trucks – including those carrying ballistic missiles for the Cold War – could clear them, thus opening the way for what we Long Islanders call our "longest parking lots" of multi-laned highways. The Cold War trumps suburban protection.[1]

The language and notion of 'intent,' while still dominant, is inverted by Edward Tenner's well-known book, *Why Things Bite Back: Technology and the Revenge of Unintended Consequences* (1996). Tenner catalogues and classifies an enormous number of technologies, presumably designed for certain uses, which end up having disastrous or contrary unintended consequences. He spoofs Toffler's notion of the paperless society, where, "making paper copies of anything is a primitive use of [electronic word processing] machines and violates their very spirit (quoted Toffler, 1970, ix), in light of the higher-papered society of today." (Tenner, 1996, ix) Or, something as simple as a home security system, designed to increase security, he contends subverts security by producing false alarms and overwhelming police ability to respond, "In Philadelphia, on 3,000 of 157,000 calls from automatic security systems over three years were real; by diverting the full-time equivalent of fifty-eight police officers for useless calls, the systems may have promoted crime elsewhere." (Tenner, 1996, 7) Tenner's examples are of *unintended*, but also of *unpredictable* effects. The patterns being traced here apply equally to simple and complex technologies. I have lived through the long term claim of virtually infinitely free energy to be produced from nuclear sources, through the Three Mile Island near melt-down situation, to the closing of Long Island's Shoreham nuclear plant, designed as part of this trajectory of designer intent, but which to date has ended in a colossal, 4,000,000,000 U.S. dollar 'technology museum' which as yet has no use.

From the comparatively simple examples above, one can note that designer intent may be subverted, become a minor use, or not result in uses in line with intended ends at all. In addition, with unintended consequences the theme becomes the unpredictability of the uses of technologies. But, there remains a persistence of

[1] In discussion, it was pointed out that there is a difference between initial design intent, and subsequent design modification, but the argument I am making is that in neither case is there simple designer control over outcomes.

the designer fallacy, that in some way 'intent' determines, however successfully or unsuccessfully, outcomes. My argument is directed *against* this framing and description of the design project. What I hope to establish is a description which recognizes much more complex relations between designers, technologies and the ultimate uses of technologies in variable social and cultural situations. My approach is descriptivist in a sense parallel to those in science studies and the history of science which eschew end results over the examination of development in process (Kuhn, Latour, Pickering). I will open the way to my counter-thesis by looking at several variations upon technologies and the embedded ways in which these function. Again, I am arguing against an individualistic notion of design, and for a more complex set of relations between multiple inputs into developing technologies and for multiple, multistable possibilities for any single technology.

First, I want to show something of how technologies are differently *embedded* in different cultural contexts. My first example is the windmill – a device which like a pinwheel turns with the wind. The most ancient example, according to Lynn White, Jr., is to be found in India, a wind-driven prayer wheel or 'automated praying device.' (White, Jr., 1971) There were, and continue to be, hand-driven prayer wheels, rotating drums on a hand-held handle, which can have written prayers on the surfaces which are then spun with the prayers presumably being sent outwards. The 'automated' prayer wheel of the wind driven device lets 'nature' do the work. Later, in Mesopotamia, larger versions of the windmill occurred in the 9th century. These devices were used to provide power for such applications as milling. Moving to Europe, 'windmill fields' were developed to help pump out the lowlands of Holland in the 9th century in an early 'technological revolution' of larger-scale power use. Finally, today, we are moving into the argument phase of wind-generated energy, well accepted and in place in Denmark, which produces nearly 20% of its energy from windmill farms. In England and the USA, such windmill farms, proposed for off-shore or mountain ridge sites, are undergoing technology assessment battles along NIMBY [not-in-my-back-yard] lines.

Abstractly, one can argue that these are all the 'same' technology, wind driven devices to supply different powers, but each example is differently culturally embedded. The need to have relatively constant praying is quite different from the need to have renewable energy, and to call each a different 'use' is to abstract from the complexity of the cultural background. The 'same' technology is embedded differently in the different historical-cultural settings. But this is also to say that the 'same' technology can fit into different contexts and is *field located*.

A closer look, however, also shows that what I have called the 'same' technology, is also materially different in each context. The Indian wind-driven prayer wheel is a relatively small device, whereas the Danish and contemporary high-tech windmill is up to a 100 meters tall; and the former responds to the speed of the wind with faster or slower revolutions, whereas the latter turns at the same speed through self-governing blade adjustment. Both entail what Andrew Pickering calls a process of "tuning" and a "dance of agency" in the development process. (Pickering, 1995)

In design, the "tuning" and "dance of agency" can often turn around 'designer intent.' Bruno Latour has made the familiar post-it example famous in *Science in*