FETISHISED OBJECTS AND HUMANISED NATURE: TOWARDS AN ANTHROPOLOGY OF TECHNOLOGY

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The concept of technology becomes useful only when its tacit preconceptions are unpacked. Linked with the term in Western discourse are two poles of mythic thinking: technological determinism and technological somnambulism. The former depicts technology as the cause of social formations; the latter denies a causal link. Both, however, disguise the social choices and social relations that figure in any technological system. To counter such notions, technology is redefined here as a *total* social phenomenon in the sense used by Mauss; it is simultaneously material, social and symbolic. To create and use a technology, then,is to humanise nature; it is to express a social vision, create a powerful symbol and engage ourselves in a form of life. The study of technology, therefore, is well suited to the interpretive tools of symbolic anthropology. This point is illustrated in a brief analysis of Sri Lanka's irrigation-based colonisation schemes.

The study of technology, Marx wrote, is of paramount importance for the human sciences: it 'discloses man's mode of dealing with nature, the process by which he sustains his life' (Marx 1938). Few anthropologists would dispute this view. Yet social and cultural anthropologists rarely turn the full force of their theoretical tools on the subject. That, I wish to argue, is a pity, since the unique field methods and holistic orientation of anthropology situate the field advantageously for the study of technology.

Social and cultural anthropologists, to be sure, have made valuable contributions to the study of subsistence and extractive strategies such as irrigation (Beardsley 1964; Downing & Gibson 1974; Geertz 1972; Gray 1973; Hunt & Hunt 1976; Leach 1959), fishing (Acheson 1981), mining (Godoy 1985; J. Nash 1979; Taussig 1980), industry (Holzberg & Giovannini 1981), and the impact of technological change (especially industrialisation) on traditional societies (e.g. Bodley 1982; Mitchell 1973; Nash 1967; Pelto 1973; Sharp 1952; Wallace 1978). Without belittling the contributions these studies have made, however, one can observe in most of them a curious oversight. Technology is only rarely seen in these studies as a subject that is *itself* intrinsically of interest. On the contrary, anthropologists frequently equate technology with material culture and see it as a given. Technology is portrayed as something fundamentally extraneous to human life and a force to which communities and beliefs are obliged to adapt. In the anthropology of mining, for example, there is an evident 'lack of interest in the productive process and workplace itself', which in a book-length monograph on mining may be treated in a 'page or two' (Godoy 1985: 211). One can

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only conclude that, in the eyes of most anthropologists, technology lies beyond the bounds of disciplinary interest.

The lack of interest in technology is paired with an equally marked inattention to the term's definition. In the 1,255 pages of Honigmann's *Handbook of social and cultural anthropology*, for instance, the term is used, peripherally and without definition, on only six pages. A computer search of *Sociological Abstracts* revealed that, of the 8,355 articles retrieved by a free-text search for *anthropology* and cognate terms, only thirty-eight contained the word 'technology' in their abstracts or subject descriptors and only four contained it in their titles; none defined the term.

The inattention to definition is surprising, to say the least, in a discipline concerned with cross-cultural translation and the critique of ethnocentric constructs. And here we have a term that stands, arguably, at the very centre of what Westerners (and Westernised people) tend to celebrate about themselves. It would be surprising indeed if it were not suffused throughout with what Mills (1963: 435) called the 'ethnocentricities of meaning'. The first step towards an anthropology of technology, then, is to unpack the cultural baggage or pre-understandings that are tacitly paired with the term technology. Taking this step, as will be seen, illuminates the unreliability of the culturally-supplied Western notion of technology and, in addition, mandates the term's redefinition for use by anthropologists. It also demonstrates why technology is in itself a subject of interest to symbolic and interpretive anthropology.

Technology and Western ideology

Textbook definitions of technology raise serious doubts about the term's utility in anthropological discourse. Technology is frequently defined, for instance, as the sum total of man's 'rational' and 'efficacious' ways of enhancing 'control over nature' (alternatives: 'command over nature', 'domination over nature', etc.); e.g., technology is 'any tool or technique, any physical equipment or method of doing or making, by which human capability is extended' (Schon 1967).

The historian Lynn White (1967) notes the implicit linkage between such definitions and the roots of Christian metaphysics, which dictate human domination of the natural world. According to White, this tradition has led the West to the threshold of a serious and self-destructive ecological crisis. Whether or not one agrees with White's analysis of the origins of this inherently ideological notion of technology, he supplies sufficient reason to treat the term with suspicion. At the minimum, it must be recognised that the concept of technology is normative.

Yet even greater perils await beneath the surface. The culturally-supplied notion of 'technology' carries with it two tacit meanings, two implicit and mythic views of the world in relation to technology, that profoundly affect how we understand technology and how we view its relationship to our lives. As will be seen, these two tacit meanings stand in apparent contradiction to one another. Yet underlying them is a deeply hidden unity.

Technological somnambulism

The first of these tacit notions is called *technological somnambulism* by the political scientist Langdon Winner (1986). In the somnambulistic view of technology provided by Western culture, the human relationship to technology is simply 'too obvious to merit serious reflection'. This relationship consists merely of 'making', which is of interest only to engineers and technicians, and 'use', which amounts only to an 'occasional, innocuous, [and] nonstructuring occurrence'. Use is understood to be a straightforward matter: you pick up a tool, use it, and put it down. The meaning of the use of technology is, in this mistaken view, 'nothing more complicated than an occasional, limited, and nonproblematic interaction' (5–6). In this view, technology is morally and ethically 'neutral'. It is neither good nor bad, and its 'impact' depends on how it is used.

What is wrong with this dream-like orientation to technology, Winner argues, is its denial of the many ways in which technology provides structure and meaning for human life. This point was made powerfully by Marx in the *German ideology* (Marx & Engels 1976: 31):

> The way in which men produce their means of subsistence depends first of all on the nature of the means of subsistence they actually find in existence and have to reproduce. This mode of production must not be considered simply as being the reproduction of the physical existence of these individuals. Rather it is a definite form of activity of these individuals, a definite form of expressing their life, a definite *mode of life* on their part. As individuals express their life, so they are.

Technologies, then, are not merely ways of 'making' and 'using'. As technologies are created and put to use, Winner (1986: 6) argues, they bring about 'significant alterations in patterns of human activity and human institutions'. What must be recognised, Winner insists, is that:

> Individuals are actively involved in the daily creation and recreation, production and reproduction, of the world in which they live. Thus, as they employ tools and techniques, work in social labor arrangements, make and consume products, and adapt their behavior to the material conditions they encounter in their natural and artificial environment, individuals realize possibilities for human existence. . . . Social activity is an ongoing activity of world-making (1986: 14–15).

Winner does not mean to suggest a simplistic technological determinism, the idea that technological innovations are the major driving forces of human life such that social and cultural forms are inevitably shaped by them. To take such a view, Winner (1986: 10) suggests, would be like describing 'all instances of sexual intercourse based only on the concept of rape'. Choices exist in the process of technological deployment and consequent societal transformation (e.g., Noble 1986). Yet technological somnambulism leads us to ignore them while, in a trance-like state, we blindly accept whatever implementation of technology those in power choose to foist upon us. Once entrenched in our lives, however, the technology makes a new world for us. We weave it into the fabric of daily life (Winner 1986). Yet the human choices and decisions are masked, so the technology seems to operate beyond human control and appears to embody the result of an automatic, inevitable process (Winner 1977).

Technological determinism

The second tacit notion supplied with the term technology, the one that contrasts so sharply with the first, is precisely this notion of technological determinism that Winner is so careful to avoid. Here we have no dismissal of technology as ways of making and using. On the contrary, technology is viewed as a powerful and autonomous agent that dictates the patterns of human social and cultural life.

Like technological somnambulism, technological determinism often operates as a tacit, unexamined assumption in scholarly discourse. In the grip of this notion all of history seems to have been dictated by a chain of technological events in which people have been little more than helpless spectators. So deeply encoded is this notion that technology's autonomy is frequently assumed without comment. Indeed, the idea often operates, in scholarly writing about technology 'in the elusive manner of an unquestioned assumption' (Staudenmaier 1985: 143).

Some scholars, however, make this position explicit and defend it, arguing that technology is applied science. Since science is progressing rapidly, the pace of technological development is, in this view, so rapid that technology is out of control; we cannot evaluate our own creations or defend ourselves against them. Yet there are ample grounds to doubt that technology is applied science in this simplistic, linear sense (Fores 1982). The relationship between technology and science is complex, dynamic, and historically recent. Many important inventions of the eighteenth and nineteenth centuries, such as the steam engine, were in no real sense the result of the application of science. Indeed, much twentieth-century science stems from an attempt to discover why certain technologies work so well. New technologies, moreover, make new lines of scientific inquiry possible, and with them, new technologies. And even when a new technology does incorporate scientific findings, it is not driven by science alone. To create a new technology is not merely to apply science to technical matters. It is also, and simultaneously, to deal with economic constraints, to surmount legal roadblocks and to get politicians on one's side (Hughes 1983). A technology's form derives, then, from the interaction of these heterogeneous elements as they are shaped into a network of interrelated components (Law 1987). However inhuman our technology may seem, it is nonetheless a product of human choices and social processes.

Others would argue that modern technology becomes an autonomous force because, once adopted, its organisational imperatives require the ascendance of technical norms of efficiency and profitability over alternative norms, such as worker health and safety, environmental preservation, and aesthetic values (Ellul 1962). Thus, in Chapple's early view (1941), the very fact that industrial production requires rational organisation dictates the ascendancy of such norms. And further: Salz (1955) argued that the technical and organisational imperatives of industrialisation 'remain the same regardless of who or what entities own, finance, and manage a given industrial plant . . . and regardless of the wider aims which industrialism is to serve' (1955: 5). To bring in a plant and automated equipment, then, is to bring in the efficiency norms a factory

requires, and the inevitable result—even in in a socialist setting (Goonatilake 1979)—is the exploitation and 'deskilling' of factory workers (e.g. Gottfried 1982). Yet efficient factories have indeed been built that do not lead to the degradation of working conditions (Noble 1979), and the annals of industrialisation in the Third World tell of numerous instances in which efficiency norms take a back seat to other ones. Even where automated devices are introduced in the West, there is no necessary, inevitable 'impact' on social relations (Attewell & Rule 1984). On the contrary, the outcome stems from social and political choices made by engineers, managers and workers (Noble 1986).

The relationship between technology and society, to be sure, can be simple and unproblematic in certain instances. Giving up a bullock for a tractor, for instance, irretrievably forces a farmer into an international economy of petroleum and replacement parts. Beyond obvious points such as this one, however, the outcome of a given innovation is still subject to substantial modification by social, political and cultural forces. It is, furthermore, fundamentally wrong to argue that a technology carries with it any necessary or consequent pattern of social and cultural evolution. The literature on the social impact of Green Revolution technology provides a telling case in point (e.g. Farmer 1977). Experience shows that the technology does not necessarily produce the higher yields foreseen by its proponents. Nor does it necessarily produce the socio-economic differentiation foreseen by its critics. A new or introduced technology such as this one simply brings a new set of possibilities to a situation. Whether people capitalise on those possibilities depends on their ability to conceptualise the restructured political field, to set new goals for themselves, and to mobilise personnel and resources in pursuit of these new goals. We here confront a series of indeterminacies in which the outcome is far from predictable.

The determinist thesis, in sum, is difficult to sustain in comparative studies. Yet this fact is no argument for a return to the tenets of technological somnambulism. The fact that technology is socially constructed (Pinch & Bijker 1984) implies that it has social content; it is far from 'neutral'. Pinch and Bijker describe the social construction of technology in the following way. In its inception, a new technology appears in a variety of forms. The process is analogous to the species-multiplying effects of an adaptive radiation of biological forms into an unoccupied series of niches. Some forms 'survive'; others 'die'. In this process, the determinant of survival is not merely (or even conspicuously) economic, technical or rational. On the contrary, the surviving form is the one selected by a social group that succeeds in imposing its choice over competing forms (and against the objections of weaker groups). Such social groups, as Pinch and Bijker stress, include institutions and organisations, as well as organised and unorganised groups of individuals, but their *fundamental* characteristic is that 'all members of [the social group] share the same set of *meanings* . . . attached to a specific artefact' (1984: 30, my emphasis). The social construction of technology, in sum, occurs when *one set of meanings gains ascendancy over other ones*, and wins expression in the technical content of the artefact. A technology is thus, in Noble's words, 'hardened history' or a 'frozen fragment of human and social endeavor' (1986: xi).

The social vision woven into technologies is at times patently obvious and deliberate, as in the now-famous example of Long Island's low bridges. Their designer, Robert Moses, intended them to obstruct buses, thereby restricting the Long Island population to automobile-owning whites of the 'upper' and 'comfortable middle' classes (Winner 1980: 121–3). And at the end of the nineteenth century, the radical Paris city council used precisely the same trick to accomplish a very different political objective. By making the tunnels of the Paris Metro very narrow, too narrow for standard-gauge railway trains, the council prevented the private railway companies from appropriating the Metro for their own ends (Akrich 1987).

Even where such designs are absent technologies still bring with them a definite social content. Any technology should be seen as a system, not just of tools, but also of related social behaviours and techniques. We mean just this when we refer, for instance, to 'woodworking' or 'irrigation'. One can go further. Technology, necessarily, consists of practical knowledge or knowhow which, although often resistant to codification or verbalisation (Ferguson 1977), must somehow be shared and transmitted just like any other aspect of culture (Layton 1974). Technology can indeed be defined as a set of operationally replicable social behaviours: no technology can be said to exist unless the people who use it can use it over and over again. To the extent that technological behaviours are replicable, the interpenetration of physical elements (e.g., tools, resources, etc.) and social communication (diffusion, apprenticeship, etc.) is presupposed (Tornatzky *et al.* 1983: 2). And further still: the product of technology, material culture, is far more than a practical instrument. Technology is, simultaneously, a social object endowed with sufficient meaning to mystify those who become involved with its creation or use. Technology, then, is *essentially* social, not 'technical'. When one examines the 'impact' of a technology on society, therefore, one is obliged to examine the impact of the technology's embedded social behaviours and meanings.

Technological determinism, in short, rests on specious grounds. Technology is not an independent, non-social variable that has an 'impact' on society or culture. On the contrary, any technology *is* a set of social behaviours and a system of meanings. To restate the point: when we examine the 'impact' of technology on society, we are talking about the impact of one kind of social behaviour on another (MacKenzie & Wajcman 1985: 3)—a point that Marx grasped with clarity and subtlety (MacKenzie 1984). To this point this article will return, but it is possible now to disclose the unity that underlies technological somnambulism and its apparent opposite, technological determinism.

Fetishised objects

What is so striking about both naive views of technology, the view that emphasises disembodied ways of making and doing (technological somnambulism) and the other that asserts technology's autonomy (technological determinism), is that they *both* gravely understate or disguise the social relations of technology. In the somnambulistic view, 'making' concerns only engineers and

'doing' concerns only users. Hidden from view is the entire network of social and political relations that are tied to making and are influenced by doing. In the technological determinist view, the technology itself (usually conceived as material culture) is seen as something apart from this network. Technology is thus, in this view, an independent variable to which the forms of social relations and politics stand as dependent variables. So there is indeed a hidden unity underlying these positions that seem to stand in apparent contradiction: technology, under the sway of Western culture, is seen as a disembodied entity, emptied of social relations, and composed almost entirely of tools and products. It stands before us, in other words, in what Marx would call *fetishised* form: *what is in reality produced by relations among people appears before us in a fantastic form as relations among things.*

Marx's concept of fetishism stems from his discussion of commodities in the capitalist setting. The world of fetishised commodities, Marx argued, is like the 'mist-enveloped regions of the religious world. In that world the productions of the human brain appear as independent beings endowed with life, and entering into relation both with one another and the human race' (Marx 1938: 43). As Godelier (1977: xxv) puts it, fetishism is

> the effect *in* and *for* consciousness of the disguising of social relations *in* and *behind* their appearances. Now these appearances are the *necessary* point of departure of the representations of their . . . relations that individuals *spontaneously* form for themselves. Such images thus constitute the social reality within which these individuals live, and serve them as a means of *acting* within and upon this social reality.

Marx's discussion was limited to the value of commodities which, he argued, is in reality determined by the surplus value extracted from the wage labourer. It nevertheless appears to us in fetishised form as a property of the commodity itself, rather than of the *social* relationships that produced it. Whether Marx's analysis of surplus value is correct in economic terms is of little concern here, except to state that it is tempting indeed to see the fetishism of technology as a natural concomitant of the fetishism of commodities (and the capitalist economy in general). What is of interest is Marx's extraordinary anthropological insight: *the Western ideology of objects renders invisible the social relations from which technology arises and in which any technology is vitally embedded.* This invisibility lies at the heart of technological somnambulism and determinism. The task of the anthropology of technology is to bring these hidden social relations to light.

Technology in anthropological discourse

Anthropologists, unfortunately, have been slow to detect the hidden influence of technological somnambulism and determinism (Digard 1979). Under the sway of the somnambulistic view, for instance, technology is simply not of much interest. Ways of making and using are seen to deserve description only in so far as they preserve evidence of a disappearing way of life. Thus one is confronted with dreary catalogues of such things as arrows and pots that are, as Spier observed, 'dull, unimaginative, myopic, and guilty of generalizing from the particular' (1970: 143).

A concomitant of this view is that technology, which is after all a simple matter of making and using, does not determine social and cultural forms except in ways that are so obvious that they are of little interest. Horticulture obviously preceded irrigation, for instance, but such observations tell us very little about the cultures we study. This was a point made by Boas and a whole generation of American anthropologists, who denied that attempts to link technology and social organisation or culture would go beyond the obvious. What was of far greater interest to Boas was the evidence, as he saw it, that dissimilar technologies could be associated with surprisingly similar cultural forms: 'we have simple industries and complex organization', he wrote (1940: 266–267), as well as 'diverse industries and simple organization'. Ruth Benedict (1948: 589), concurring with Boas's radical denial of a necessary link between technology and culture, asserted that 'man can at any state of technological development create his gods in the most diverse form'. This position is an old one in American anthropology, and it is not without its contemporary advocates.

Replying for technological determinism are such authors as L. A. White (1959), Wittfogel (1959) and Harris (1977), who trace major developments in cultural evolution to the patterns of technological change. Technology, in the determinist view, is seen to evolve according to its own, autonomous logic: 'the digging stick *had* to precede the plow, the flint strike-a-light *had* to precede the safety match, and so on' (Harris 1968: 232). In this view the consequences of this evolutionary process for social organisation and culture are regular and predictable: when the plough replaces the hoe, for instance, the sexual division of labour alters in predictable ways (Newton 1985: 214). Wittfogel, to cite another determinist theorist, believed that large-scale irrigation systems entail bureaucratic centralisation and political despotism. And for Harris, the odd customs and bizarre practices of tribal cultures, such as human sacrifice and witchcraft, have a ready explanation: they have some hidden techno-economic rationality, which is exposed only by reducing such practices to their 'hidden' material aims (e.g. Harris 1974). In this view, there are no surprises in the jungle of ethnographic data. Every seemingly bizarre trait can be laid down to its underlying techno-economic rationality.

Both of these anthropological versions of Western cultural theory are remarkable for their inherent dogmatism, itself a sign of their ideological origin. Somnambulists deny at the outset that there is a demonstrable relation between technology and culture. Determinists assume such a relationship always exists. Both views, in short, see technology in fetishised form. Both disguise the fundamentally *social* behaviours in which people engage when they create or use a technology.

Humanised nature

The anthropology of technology must be founded, not on simplistic and ideologically-shaped propositions, but rather on a recognition of the role of fetishism—specifically, in disguising the deep interpenetration and dynamic interplay of social forms, cultural values and technology (Spier 1970: 6–9). To counter the mystifying force of fetishism, it is necessary to see technology in a

radically different way: to view it, not through the fetishism of technological somnambulism or determinism, but rather as humanised nature.

To say that technology is humanised nature is to insist that it is a fundamentally *social* phenomenon: it is a social construction of the nature around us and within us, and once achieved, it expresses an embedded social vision, and it engages us in what Marx would call a form of life. The interpenetration of culture and nature here described is, in short, of the sort that Mauss (1967) would readily call *total*: any behaviour that is technological is also, and at the same time, political, social and symbolic. It has a legal dimension, it has a history, it entails a set of social relationships and it has a meaning.

So far from disguising the social relations and cultural dimension of technology, this view logically necessitates a recognition of the interpenetration of technology with social forms and systems of meaning. Any study of technology's 'impact' is in consequence the study of a complex, intercausal relationship between one form of social behaviour and another. There is no question of finding a nice, neat causal arrow that points from an independent variable to a dependent one, for the causal arrows run both ways (or every which way), even in what appears to be the simplest of settings. One might be tempted, for instance, to regard the culture of the !Kung-San peoples of southwestern Africa, hunters and gathers until recently, as the product of environmental dominance brought on by a low level of technological development—until, however, one learns that the !Kung-San regularly and deliberately set fire to the grasslands, and so shape the environment that we might suppose shapes them. 'Humans', Lee observes, 'have been cooking their environment for as long as they have been cooking food' (1979: 147). Dynamic interplay and interpenetration of variables is to be expected from the theoretical standpoint. Assertions of one-way causality, in contrast, are suspect and require radical questioning.

Viewing technology as humanised nature does not, unfortunately, make things simple. On the contrary, it forces recognition of the almost unbelievable complexity that is involved in virtually any link between human technological forms and human culture. The questions this relationship raises, to be sure, seem simple enough on the surface (e.g. 'What is the impact of gravity-flow irrigation schemes on peasants in Sri Lanka?'). Yet, in practice, discovering the effects of a given technology on society is, as MacKenzie and Wajcman note, an 'intensely difficult and problematic exercise'. Consider, for instance, the impact of the microchip on employment:

> It is relatively easy to guess what proportion of existing jobs could be automated away by present or prospective computer technology. But that is not the effect of the microchip on employment, precisely because the question cannot justifiably be approached in isolation like this. To know the microchip's effect on employment levels, one needs to know the different rates at which it will be adopted in different locations, the nature of the industries producing computer technology, the indirect economic effects of the creation and destruction of jobs, the likely role of developments in one country with what goes on in other countries, the growth or decline, and changing patterns, of the world economy . . . in other words, answering the question of the effects on society of a particular technology requires one to have a *good theory of how that society works*. The simplicity of the question is misleading. *Answering it properly will often require an understanding of the overall dynamics of a society, and it is thus one of the most difficult, rather than one of the easiest, questions to answer* (MacKenzie & Wajcman 1985: 6–7, my emphasis).

Anthropology, at its best, is uniquely suited to the study of such complex relationships between technology and culture. Anthropology is distinctive, after all, not only for its local-level, small-scale studies using the participant-observation method. It is also distinctive for its holism, an approach that sees any society as a system of more or less interrelated components. To undertake such an analysis requires at least a working knowledge of a society's biological environment, history, social organisation, political system, economic system, international relations, cultural values and spiritual life. Such analyses are by no means easy; they require nothing less than a commitment to situate behaviours and meanings in their total social, historical and cultural context. Yet nothing less will suffice if we seek to illuminate the nature and consequences of our attempts to humanise nature.

An example: Sri Lanka's irrigation settlement schemes

To illustrate this approach fully requires more space than can be taken here, but the broad outlines of a study phrased in the terms developed here can be sketched out for purposes of illustration. (References will be omitted for brevity; see Pfaffenberger n.d. for a full account.)

The island nation of Sri Lanka has been much concerned of late with the development of gravity-flow irrigation settlement schemes, the latest of which is the massive Mahaweli Development Project. This project seeks to develop fully the irrigation capabilities of the 208-mile Mahaweli Ganga, Sri Lanka's longest river. A major goal of the project, like its predecessors, is to resettle landless peasants on newly irrigated lands within the country's Dry Zone. Although the still-unfinished project has raised Sri Lanka's rice production and helped to free the country from dependence on rice imports, the economic performance of the new rice-growing communities has fallen short of expectations. Particularly disappointing is the project's social performance. So far from liberating landless peasants from debt servitude and agricultural tenancy, the Mahaweli settlements appear to be reproducing the adverse features of traditional peasant society that the project was designed to cure.

The Mahaweli Project's outcomes echo the disappointing performance of its predecessors, which were marked by serious deficiencies in the management and distribution of water resources. The reasons, some argue, are 'technical' in nature. Since their inception decades ago, Sri Lanka's irrigation development projects have employed gravity-flow principles, in which a river is dammed and diverted, via canals, to agricultural settlements. The volume and pressure of water supply in gravity-flow irrigation works is always greatest at the 'top end' of the system. And not surprisingly, settlers at the top end of the irrigation projects, where the water supply is continuous and ample, use from two to seven times as much water as they need. At the same time, settlers at the tail end of the projects receive insufficient water—or no water at all. The result is a process of socio-economic differentiation, in which top-enders tend to become wealthy and tail-enders tend to become poor and, eventually, lose their land to moneylenders and land speculators.

Top-enders use the extra water to free themselves from the expense of hiring

labourers to clear weeds (the copious water does the job instead) and to assure themselves an abundant crop. They invest their profits by encouraging irrigation management officials (in varied ways) to keep the floodgates wide open and by involving less fortunate settlers in high-interest loans (which often result in the debtors becoming tenants on lands they themselves once owned). In the end, these social processes lead to the reproduction of some of the features of traditional peasant society (such as landlessness, sharecropping, and debt servitude) that the project was expressly created to circumvent.

That this disparity in income between top-enders and tail-enders should emerge is hardly surprising when one considers what one observer calls the 'harsh facts of hydraulics', namely, the pronounced tendency of gravity-flow irrigation technology to reward top-enders and punish tail-enders. This tendency can be combatted by building extensive systems of field channels and automated delivery systems, but such systems can add so much to the cost of the project that it ceases to be cost-effective. If one builds an irrigation system that lacks such features, the seemingly inevitable result is economic disparity between top-enders and tail-enders.

Yet this interpretation smacks of technological determinism, a viewpoint that the anthropology of technology mistrusts on theoretical grounds. And on closer inspection, using ethnographic material supplied by Sri Lanka itself, it turns out that the 'harsh facts of hydraulics' are not as determinative of social relations as this view would have it. Sri Lankans, after all, have been irrigating rice fields for two millennia, and as it happens traditional Sri Lankan villages had devised several customs that operated to mute, if not negate, the economic disparities implicit in gravity-flow irrigation systems. In a village studied by Leach, for instance, top-end and tail-end landholdings were always linked, even in property transfers, so that the benefits of the top end were balanced out by the penalties of the tail end. This custom was accompanied by a complex system of rights to irrigation water that discouraged top-end wastage and adjusted the scope of agricultural activity to the amount of water available. At the heart of the system was a clear recognition that, in an irrigated production system, what counts is access to *water*, not merely to land. Subsequent research has shown that such customs are common in traditional, community-based irrigation systems. The point here is not to romanticise traditional irrigation customs, but simply this: gravity-flow irrigation technology is not merely a matter of things, that is, dams, canals and water. This technology is also a *system of human social behaviours*, characterised by the ascription—or the non-ascription—of rights to water. If rights to land are ascribed instead of rights to water, one possible outcome (in the absence of countervailing customs) is socio-economic differentiation. The design flaw in Sri Lanka's irrigation settlements is that the need to design water-allocation procedures and rights into the technology has been consistently and thoroughly ignored. The reasons for this oversight can be known only by grasping the social and cultural circumstances under which the technology was constructed.

The Sri Lankan project planners envisioned communities of sturdy, independent, yeoman farmers who possess secure land tenure. Thus protected from exploitation and poverty, such farmers would naturally regard their protector,

the state, with affection and loyalty. This idea, obviously of European cultural origin, occurred to Sri Lanka's conservative political leadership (with, perhaps, British encouragement) after the second world war, when landlessness and political radicalism were growing ominously in the densely-populated south-western coastal plan. The extension of irrigation facilities into the sparsely-populated Dry Zone was expressly conceptualised as a way of domesticating or co-opting this dangerous (and increasingly *lumpen*) rural proletariat. Yet there is more to the social construction of this technology than this brand of Western political sensibility. What made it so useful is that it dovetails handily with a particularly Sri Lankan modality of political legitimation.

Sri Lanka's political elite finds its legitimacy, in part, in an indigenous political framework that stems from the ancient Sinhala civilisational tradition (or more accurately, from modern interpretations of that tradition). The ancient Sinhala kings legitimated their rule by constructing irrigation works, and modern politicians—especially those of the ruling United National Party—emulate their example. The early movers of irrigation projects, the United National Party leaders D. S. Senanayake and his son Dudley, claimed descent from the ancient Dry Zone kings. Their UNP successor, President J. R. Jayawardene, is often described as a Boddhisattva who, like the kings of old, is bringing water, prosperity and justice (*dharma*) to the people; in an annual ceremony, he emulates the king of old by driving the buffaloes into the field to cut the season's first furrow.

The same elite draws its legitimacy from another source, as well: a politically-constructed myth about the deleterious impact of the colonial plantation economy on peasant society. This myth insists that the foreign-owned plantations, in collusion with the British colonial government, deprived traditional villages of land needed for expansion, and in so doing set off a vicious cycle of land fragmentation that finally culminated in widespread landlessness, share-cropping, poverty and moral degradation for huge masses of peasants. By seeking independence and promising to right these wrongs by developing irrigation settlements, Sri Lanka's indigenous political elite found a successful formula for political legitimacy. To describe this notion of the plantation's impact as a 'myth' is not to deny, to be sure, that there may be some truth to it. But it is to insist that, like all myths, this myth tends to be applied uncritically. And nowhere did it operate more perniciously than in the social design of the irrigation settlements.

The social goals of the irrigation settlements were, from the beginning, expressly intended to forestall land fragmentation, which was seen to have played a major role in the rise of landlessness during and after the colonial period. So the settlement plots—surveyed and fixed plots of up to five acres of irrigated rice land—were not given to the settlers outright, but were assigned to them by perpetual lease and made indivisible. A peasant could pass them on to his heirs only by nominating a single successor.

Although this social vision may have been politically satisfying, it could not have been more inappropriate for Sri Lankan conditions. By focusing on the politically marketable image of secure *land* rights for the peasantry, it fails to acknowledge the importance of *water* rights for stable irrigation communities,

and so condemns the settlements to precisely the socio-economic differentiation that the projects were intended to avoid. Ruled out in the stroke of a pen, too, was the kind of careful, inter-familial juggling of land holdings that, in traditional Sri Lankan communities, help farmers to put together a holding of economic size. In the politically-focused lens of the project's design, such jugglings appear as 'fragmentation', and are branded—often wrongly—as undesirable indices of community degradation. Finally, the atomistic individualism of the project's social design, coupled with the diverse social origins of the settlers themselves, has militated against the formation of kin-based systems of reciprocity and resource sharing. In successful irrigation communities, such systems frequently function to mute processes of socio-economic differentiation by enabling what amounts to a process of intracommunity capital transfer, as families help each other out (for instance, by hiring kinsmen at rates far above the economic wage).

What was not ruled out in the project design, however, was any effective legal or political mechanism to forestall the 'sale' of the settler's plots to *mudalalis*, a class of 'self-made' landholders and moneylenders who have long preyed on peasants throughout Sri Lanka. Such sales are illegal in principle, but common in practice. Since titles are held to land, not water, 'tail-end' settlers quickly fall behind in the competition for water and wealth, and surrender their holdings to land speculators. Some wind up as tenants on their own lands, an arrangement that may well bring the tenant more economic security than was possible as an impoverished 'owner' of the land in question. Moreover, the prohibition on land fragmentation flies in the face of Sri Lankan inheritance customs. Not a few settlers prefer to 'sell' their plots (illegally) rather than face the disconcerting and uncomfortable prospect of favouring one heir over others. Other factors, such as irregularities in water supply, the vicissitudes of the rice market, the rise of fertiliser and herbicide prices, and mismanagement, also contribute to the 'sale' of plots to *mudalalis*. In one settlement scheme, a *mudalali* was found to have amassed a 'holding' of 100 acres of prime rice land, irrigated at public expense. There is nothing new about the activities of *mudalalis*. What is new is the massive public investment in the settlement schemes, which have created rich new opportunities for the *mudalalis'* activities. Indeed, the schemes create new *mudalalis*. They enrich top-enders so that they may choose, among several alternative careers, the *mudalali*'s way of money-lending, bribery and land speculation.

That the older irrigation settlements were promoting socio-economic differentiation has been known for some time, but the new phase of irrigation development under the Accelerated Mahaweli Development Program (AMDP) sought to forestall such processes by using the expensive technical solution of constructing field channels to groups of settlers. For reasons that are hardly surprising given the above analysis, this strategy does not appear to be working. Processes of socio-economic differentiation are well at work in the new AMDP settlements. Price fluctuations, irregularities in water supply and other problems frequently bring the settlers to the *mudalali* who, for all his propensity to exploit the peasant and deprive him of his land, still offers the peasant more day-to-day security than the government-sponsored arrangements. In the

absence of kinsmen in the atomised settlement communities, there is nowhere else to turn when a child falls ill or new clothes are needed for an important event. The 'technical fix' of field channels, in sum, has not worked very well because only the material component of the technology has been changed. Its social, legal and mythic components have been left alone, and expose the peasant settler to a socio-political context in which economic differentiation is virtually assured.

Conclusion

Technology, defined anthropologically, is not material culture but rather a *total* social phenomenon in the sense used by Mauss, a phenomenon that marries the material, the social and the symbolic in a complex web of associations. A technology is far more than the material object that appears under the sway of the Western penchant for fetishism, the tendency to unhinge human creations from the social relations that produce them. Every technology is a human world, a form of humanised nature, that unifies virtually every aspect of human endeavour. To construct a technology is not merely to deploy materials and techniques; it is also to construct social and economic alliances, to invent new legal principles for social relations, and to provide powerful new vehicles for culturally-provided myths. The 'impact' of irrigation technology on the society taking shape in Sri Lanka's irrigation-based settlement schemes cannot be grasped, therefore, until this technology is seen in its totality, a totality that embraces not only the 'harsh facts of hydraulics' (the implicit disparity between top-enders and tail-enders), but what is more, the choices that the project designers made in defining the colonies' social relations, and, in particular, the powerful political myths that guided them to these choices.

There remains to concede, however, that a technological innovation's social and mythic dimensions may become starkly apparent when it is perceived to fail. After the Challenger disaster, for instance, the American space shuttle programme came to be seen as a product, not of science and reason, but rather of political compromise, flawed communication and confused goals. If an innovation succeeds, however, the social and mythic dimensions stay in the background. The innovation's success will be attributed to the project's unerring navigation of the true course laid down by the laws of nature, efficiency and reason.

Here is yet another trap for the mind, one that is even more insidious than fetishism. To argue that only a failed technology is socially constructed (and, by implication, that successful ones are *not* socially constructed) violates the principle of symmetry in sociological explanation: we should use the same explanatory principles to account for a successful innovation as a failed one (Latour 1987). Many examples—the American automobile, for instance (Flink 1975)—can indeed be found of successful technologies in which the technical design betrays the thorough interweaving of materials and techniques with social visions and mythic conceptions. Yet we must go further. To create a new technology is to create not only a new artefact, but also a new world of social

relations and myths in which definitions of what 'works' and is 'successful' are constructed by the same political relations the technology engenders. It could be objected, to be sure, that a technology either 'works' or it doesn't, but this objection obscures the mounting evidence that creating a 'successful' technology also requires creating and disseminating the very norms that define it as successful (MacKenzie 1987). In Sri Lanka, for instance, the web of political associations created along with the dams and canals—a web that includes the influx of foreign economic assistance, the provision of lucrative construction contracts, and the creation of politically indebted communities—is of such vital significance to the ruling United National Party government that the project's 'failings' cannot be admitted, save in private and off the record. The project may have plunged generations of Sri Lankans into debt, damaged the ecology of river valleys and created dangerous new contexts for political violence, but none of this can be conceded without undermining a political edifice of impressive dimensions and complexity. So far as Sri Lankan government officials are concerned, the AMDP project is a great success. To put it another way, these officials are part of a huge enterprise whose stability and endurance depends, in part, on constructing new norms of 'success' and, equally, resisting the intrusions of external and unwanted norms of 'failure'. If they succeed, the technology becomes a 'black box': few question its design or the norms that define it as a success (MacKenzie 1987). And its social origins disappear from view.

Technology, in short, is a mystifying force of the first order, and it is rivalled only by language in its potential (to paraphrase Geertz) for suspending us in webs of significance that we ourselves create. That is why it is an appropriate —indeed crucial—subject for anthropological study.

NOTE

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Objets fétiches et nature humanisée: vers une anthropologie de la technologie

Résumé

Le concept de technologie devient utile seulement lorsque ses préconceptions tacites sont mises au jour. Dans le discours occidental le terme technologie est lié à deux extrémités de la pensée mythique: le déterminisme et le somnambulisme technologiques. Le premier décrit la technologie comme la cause de la formation sociale; le dernier nie ce lien de causalité. Tous les deux, cependant, occultent les choix sociaux et les relations sociales qui appartiennent à tout système technologique. Pour rendre de telles notions caduques, la technologie est redéfinie ici comme étant un phénomène social *total* dans le sens utilisé par Mauss; un phénomène à la fois matériel, social, et symbolique. Créer et utiliser une technologie, c'est alors humaniser la nature; c'est exprimer une vision sociale, créer un symbole puissant, et s'engager soi-même dans une forme de vie. L'étude de la technologie, par conséquent, s'adapte bien aux outils d'interprétation de l'anthropologie symbolique. Ce point est illustré par une analyse brève des projets coloniaux d'irrigation du Sri Lanka.