

## CULTURAL CHANGE

In this essay I've painted a rather depressing picture of schools as grim, self-perpetuating systems of repressive mediocrity for their employees and their students. I've described how technologies are variously embraced and resisted in the effort to strengthen this system and maintain the organizational status quo. I've tried to make clear that since schools are complex organizations not all their component members or constituencies have identical interests at all times; that a technology that is favorable to one faction at a given moment may be resisted by another which might favor it for different reasons under different circumstances. Most importantly, I've tried to show that technologies are neither value-free nor constituted simply by machines or processes themselves. Rather, they are the uses of machines in support of highly normative, value-laden institutional and social systems.

I don't believe that decisions to deploy or not deploy a given technology are made with diabolic or conspiratorial intent. I don't believe that teachers and administrators consciously plot to consolidate their hegemony. Rather, I believe that the mental model under which they operate forecloses some options even before they can be formally considered, while making others seem natural, neutral, and, most dangerously, value-free. It is those latter options, those 'easy' technologies that are adopted and implemented in schools. If one accepts this framework, there are only two ways to imagine a relationship between an introduction of technology into schools and a substantive change in what schools do and how they do it. The first is to believe that some technologies can function as Trojan Horses; that is, that they can engender practices which schools find desirable or acceptable but which nevertheless operationalize new underlying values which in turn bring about fundamental change in school structure and practice.

The second is to hope that schools will come to re-evaluate the social purposes they serve, the manner in which they serve them, or the principles of socially-developed cognition from which they operate. The impetus for this change may be internal, as teachers and administrators decide that their self-interest in serving new purposes is greater than their interest in perpetuating the existing scheme of things. It may be external, as powerful outside forces adjust the inputs available to and outputs desired from the schools. It may be institutional, as restructuring initiatives encourage schools to compete with one another in a newly-created educational marketplace.

To a certain extent all these processes are underway, albeit slowly,

unevenly, and amidst contestation. On the Trojan Horse front, there are more and more reports of teachers taking physical and pedagogical control of computers from the labs and the technologists. They are being placed in classrooms and used as polymorphic resources, facilitators, and enablers of complex social learning activities (Newman, 1990, 1992; Kerr, 1991). As computers themselves grow farther from their origins as military-industrial technologies, educational technologists increasingly are people whose values are more child-centered than those of their predecessors. This is reflected in the software they create, the uses they imagine for technology, and their ideas about exploration and collaboration (Char & Newman, 1986; Wilson & Tally, 1991; Collins & Brown, 1986). Nationally, the rhetoric of economic competitiveness used to justify the National Research and Education Network (and now its putative successor, the Information Superhighway) has encouraged the deployment of several national school network testbeds. These prototype partnerships between public schools, private research organizations, and the National Science Foundation link geographically dispersed students and teachers together with one another and with shared databases. The collaborative, project-based explorations they are designed to support more closely resemble science as practiced by scientists (or history as practiced by historians) than they do the usual classroom-based, decontextualized, and teacher-centered approach to learning. Such project nearly always result in a significant deauthorization of the teacher as the source of knowledge, a shift embraced by most teachers who experience it because it allows them to spend more time facilitating student learning and less time maintaining their real and symbolic authority. If students, parents, and teachers are all pleased with the cognitive and affective changes induced locally by working with these types of tools (and it is by no means certain that they will be), it may become difficult to sustain the older, more repressive features of school organization of which centrally-administered and imposed technology is but one example.

The second possibility, that schools will re-evaluate their means and ends, also seems to have momentum behind it, at least within a somewhat circumscribed compass. Teachers and administrators are taking steps to secure the autonomy necessary to re-engineer schools-as-technologies, though not all are happy with this unforeseen responsibility and some choose to abdicate it. Nevertheless, for the first time practitioners are being given the chance to re-design schools based on what they've learned from their experiences with children. Given that chance, many teachers and administrators are demonstrating that schools and school technology can support practices of the kind which reflect values described by Wendell Berry in another context as care, competence, and frugality in the uses of the world (Berry, 1970). Others are using the opportunity to reconstruct the role of the school within its larger community. In

Mendocino, California, for example, an area devastated by declines in the traditional fishing and timber industries, the local high school has taken the lead role in developing a community-wide information infrastructure designed to encourage a fundamental shift in the local economic base away from natural resource dependency and towards information work. While initially dependent on NASA's K-12 Internet program for connectivity, the school district has moved to create partnerships with local providers to both secure its own telecommunications needs and be able to resell excess capacity to community businesses brought online by the school's own adult education programs. The school is moving towards a project-based approach that relies on Internet access in every classroom to devise an updated version of vocational education (many of their students will not go on to four year colleges) that meets both state requirements and the Mendocino staffs' wishes for a radically different work environment for them and their students.

It remains to be seen whether instances like these will multiply and reinforce one another or whether they will remain isolated counter-examples, "demonstration projects" whose signaling of modernity serves mostly to inoculate the larger system against meaningful change. If schools are in fact able to be more than rhetorically responsive to either local initiatives or global trends it will be because these impetuses are themselves manifestations of a more significant and far-reaching shift: a change in the dominant mechanical metaphor on which we model our institutions. As we move from machine to information models we will inevitably require that our institutions reflect the increased fluidity, immanence, and ubiquity that such models presuppose (See Note 5). As we change our medieval conceptions of information from something that is stored in a fixed, canonical form in a repository designed exclusively for that purpose and whose transfer is a formal, specialized activity that takes place mainly within machines called schools, schools will change too. They will not, as some naively claim, become redundant or vestigial simply because their primacy as information-processing modelers is diminished (Perelman, 1992). Rather, they will continue to perform the same functions they always have: those relating to the reproduction of the values and processes of the society in which they're situated.

What this underlines, I think, is that machines can indeed change the culture of organizations, even ones as entrenched and recalcitrant as schools have proven to be. But they do it not, as technologists have generally imagined, by enabling schools to do the same job only better (more cheaply, more efficiently, more consistently, more equitably) but by causing them to change their conception of both what it is they do and the world in which they do it. This shift is not instigated by the

machines deployed within schools but by those outside of it, those that shape and organize the social, economic, and informative relationships in which schools are situated and which they perpetuate. This is not the same as saying that machines which are widely used outside the classroom will automatically diffuse osmotically into the classroom and be used there: history shows that this is clearly not the norm.

What is happening, simply put, is that the wide, wet world is rapidly changing the ways it organizes its work, its people, and its processes, reconceptualizing them around the metaphors and practices enabled and embodied by its new supreme machines, distributed microcomputer networks. Archaic organizations from the CIA to IBM to the university have fundamentally rearranged themselves along the lines I've outlined in the notes to this report. Schools have been out of step with this change, and it is this misalignment more than anything else that causes us to say that schools are "failing" when in fact they are doing exactly the jobs they were set up and refined over generations to perform. It is the world around them that has changed, so much so that the jobs we asked them to carry out now seem ridiculous, now make us angry.

The fundamental instinct of durable organizations is to resist change: that is why they are durable. As schools scurry to serve the new bidding of the old masters, and as they induct younger workers raised and trained under the auspices of new models and new practices, we discover--not surprisingly--that schools too are reorienting themselves along the lines of the latest dominant machine and, consequently, welcome those machines inside to assist in their nascent realignment of means and ends.

The norms and procedures of entrenched bureaucratic organizations are strong and self-reinforcing. They attract people of like minds and repel or expel those who don't share them. Schools are technologies, machines with a purpose. They embed their norms and processes in their outputs, which in the case of schools helps them to further strengthen their cultural position and resist marginalization. But they can never be independent of the values of society at large: if those change, as I believe they are beginning to, then schools must too. If they do not, then they will be replaced, relegated to the parts-bin of history.

## NOTES

1. This usage of the schools to promote an "outside" agenda once again invokes their role as a transmission technology even as it fails to take

into account the schools' own values and culture. It shares the technologists' instrumentalism, albeit to different ends.

2. Although we may apotheosize this habit we didn't invent it. The desire to apprehend the complexity of the world, to encompass it in a more immediately accessible form, gives Western culture a long, albeit narrow, history of mechanical and neo-mechanical metaphor. The shift from one metaphor to another generally lags technology itself by a generation or so, and each shift to a new metaphor drastically effects the way cultures view the natural and human worlds.

Until the fourteenth century there were no such metaphors. Indeed, the rope of nearly all metaphor, metonymy, and analogy was tied to the natural or supernatural rather than to the created world, simply because there were no complex machines as we understand them today. The invention of the astrolabe, and its close and quick descendant, the clock, provided the first tangible human creation whose complexity was sufficient to embody the observed complexity of the natural world. It's at this time that we start seeing references to the intricate 'workings' of things and of their proper 'regulation,' usually of the cosmos and nature, although occasionally of human systems as well. The clock, with its numerous intricate, precise, and interlocking components, an felicitous ability to corporealize the abstraction of temporality, shaped western perceptions of the world by serving as its chief systemic metaphor for the next five hundred years.

In the early nineteenth-century, the metaphor of the clock was gradually replaced by that of the engine, and somewhat more generally, by the notion of the machine as a phylum unto itself. The figures shift from those of intricacy and precision to those of 'drive' and 'power,' from regulation to motivation. In the early twentieth-century, as technology became more sophisticated, the concepts of motivation and regulation were to some extent merged in the figure of the self-regulating machine. This is essentially the dominant metaphor with which we've grown up, the notion of a 'system' which contains the means of both its own perpetuity and its own governance, and this metaphor has been applied to everything from political science, to nature, to the human body, to the human mind. The engineic 'drive' of the Freudian unconscious, Darwinian evolution, and the Marxian proletariat give way to 'family systems,' ecosystems, and political equilibria as the Industrial Revolution lurches to a close.

The edges of a new metaphor for complex systems can be seen emerging, however, one which is able to embrace the relativity and immanence which stress mechanical metaphors to the point of fatigue: that of the computer and its data networks. We see, and will see more, large-scale shifts away from the concepts of drive and regulation to those of processing and

transmission. The raw material upon which processes act will be regarded not as objects and forces but as data, which is not a thing but immanence its elf, an arbitrary arrangement given temporary and virtual form. The action will be seen as a program, a set of instructions, allowing for more or fewer degrees of freedom. Interrelationships will be embodied in paths, arrangements, and pointers rather than linkages (creakingly mechanical) through which objects transmit force. Important phylogenic distinctions will be made between hardware (that which is fixed/infrastructure) and software (that which determines use and function). This has tremendous consequences for our notions of property, of originality and authorship, of privacy and relationship. It may, perhaps, be less limiting than the mechanical metaphors it will largely displace.

3. It is neither possible nor desirable to ignore the issue of gender here. It may be coincidence that the classroom, the one place where women have historically had a dominant institutional place, is repeatedly characterized by technologists as a place of darkness and chaos, stubbornly resistant to the enlightening gifts of rationalized technology. It may be coincidence that educational technologists are as a group overwhelmingly male but direct their efforts at transformation not at the powerful (and overwhelmingly male) community of planners and administrators but at the formally powerless and (overwhelmingly female) community of practitioners. It may be coincidence that the terms used to describe the insufficiency of the classroom and to condescend to the folk-craft of teaching are the same terms used by an androgenized society to derogate women's values and women's work generally. But that's a lot of coincidence. Kerr discusses the differences in world-view and values between the teachers who deal with children and the technologists who approach the classroom from industrial and, as Noble demonstrates, often military backgrounds as well (Kerr, 1990; Noble, 1991). He stops short of characterizing what may perhaps be obvious but nevertheless should be acknowledged: the casual, pervasive, pathetic misogyny which characterizes the attitude of dominant culture towards any environment or activity that is predominantly female. It is perhaps for this reason that we never see proposals to replace (mostly male ) administrators with machines. The usage of computers to perform administrative tasks should pose no more, and probably fewer, value dilemmas and conflicts than their usage to define and practice teaching.

4. The question of capture processes in education deserves more exploration than I can give it here. As put forth by Agre, "capture" describes the restructuring of workplace practices to facilitate the capture of information by a ubiquitous network technology. It contrasts with the surveillance model, which relies on visual metaphors, is surreptitious, and is centrally organized. Capture processes, on the

other hand, don't watch what you do but continuously interact with it. They are about as far from surreptitious as you can get, since they involve the active reorganization of activities for the explicit purpose of gathering information. Rather than being centrally directed they are (re)enacted by individuals as they perform a socially-embedded set of tasks. Agre cites as examples Automatic Vehicle Identification for highway toll collection, and the organization of large restaurant chains where every action from the greeting of customers to the taking of orders to the preparation of food is designed around the needs of computerized information capture (Agre, 1993).

5. In the shift from a mechanical to a digital organization of society we can expect the following changes in the social construction of relationship: Information, not authority; networks and pointers, not linkages; inexpensive ubiquity, not dear scarcity; simultaneous possession, not mutually-exclusive ownership; instantaneity/timeshifting, not temporality; community of interests, not community of place; distributed horizontality not centralized verticality. I don't contend that we thereby usher in Utopia. These new structures will bring new strictures. But they will be very, very, different.

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