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The Stories Digital Tools Tell

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The modernist belief that technology is neutral has been so discounted that it seems almost unnecessary to reiterate it. We know the design of a technology has consequences that go well beyond the explicit "functions" the tool is expected to perform. It seems like ages, though it's been only a few decades, since anyone could have asked,

in view of the simplicity of technological engineering, and the complexity of social engineering, to what extent can social problems be circumvented by reducing them to technological problems? Can we identify Quick Technological Fixes for profound and almost infinitely complicated social problems, "fixes" that are within the grasp of modern technology, and which would either eliminate the original social problem without requiring a change in the individual's social attitudes, or would so alter the problem as to make its resolution more feasible?¹

We're now amused, or a bit shocked, by the naivete of Weinberg's tragically optimistic question -- not to mention that his answer was a qualified "yes," pointing to, of all things, the hydrogen bomb as a successful technological fix for the problem of war.

We can only hope that we'll never be so oblivious to the consequences of technologies, but it's a surprisingly slippery lesson. We still look for, and long for, "technological fixes." We hope trigger locks will reduce criminal violence, cameras fitted with facial recognition algorithms will ensure public safety, smart ID cards will squelch terrorism, or the V-chip will protect children from sex and violence. These technologies hold out the promise of attaining progressive social goals, and of doing so effectively and without discrimination -- a promise built upon the persistent belief that technologies exist outside the frailty and selfishness of human politics.

And, as more of our interactions with the world around us -- commercial, political, communicative, and artistic -- are in digital form, it's been surprisingly easy for us to once again forget what we've learned. Caught in the blood-in-the-ears rush of hype, smitten by novelty, we regularly overlook the most glaring of continuities. The immateriality of digital tools has often been pointed to as proof that they do not work like more earthly artifacts; our fantasies of frictionless digital transaction and intuitive interfaces preach the same mistaken faith -- that our tools are our silent partners, helping us in our goals with no agendas of their own. So, as we work to develop increasingly sophisticated insights into digital culture, it is important to rehearse this critical lesson, to remind ourselves to apply it to new technologies, and to develop a language in which it will be less easily forgotten.

Artifacts Have Politics

Technology is, from the start and at every moment, fully embedded in a social matrix of institutions, activities, and values; at the same time, every human activity is both bounded by and fundamentally in negotiation with a range of technologies. "All relevant social groups contribute to the social construction of technology; all relevant artifacts contribute to the construction of social relations."² An analysis of software, then, must begin with a sense of the way technologies may have powerful consequences for the social activities that happen with them, in the worlds imagined by them -- as Winner put it, these "artifacts have politics."

The tendency to treat technology as neutral is so pervasive, it is literally difficult to question it. Winner notes that "to argue that certain technologies *in themselves* have political properties seems, at first glance, completely mistaken. We all know that people have politics, not things. To discover either virtues or evils in aggregates of steel, plastic, transistors, integrated circuits, and chemicals seems just plain wrong, a way of mystifying human artifice and of avoiding the true sources, the human sources of freedom and oppression, justice and injustice."³ If we are to take this approach seriously, we must adopt a different perspective on the "things" we surround ourselves

with. No longer mere tools subordinated to the human will, things must be studied as artifacts -- "an artifact is an aspect of the material world that has been modified over the history of its incorporation into goal-directed human action."⁴ Once we can see artifacts as crystallized forms of human labor, communication, and value, the importance of how they shape activity becomes clearer. And it requires a subtle understanding of how a technology can have distinct political valences, picking and choosing among human practices according to a veiled agenda.

Most of the discussions of such political valences focus on technologies that, on the surface, do not claim to regulate behavior. Langdon Winner turns, controversially,⁵ to the Long Island highway overpasses designed by Robert Moses. In building particularly low bridges, the highway - and the beaches they led to -- would be more accessible to wealthier New Yorkers with cars, but less so to the (mostly African-American) working class, who needed public busses to leave the city. The material design of the bridges, their height and inflexibility, combine with the class "dimensions" of public and private transportation to enforce a particular social politics. The technology itself can "engineer relationships among people that, after a time, becomes just another part of the landscape."⁶

Bruno Latour focuses on an even more mundane object, the hydraulic "door-closer" that shuts the front door at his department. He notes that technologies are nonhuman "lieutenants" designed to replace the work of people -- but they always come with consequences: these devices may help shut the door behind us, but they are kinder to me than to the small child, the disabled, or the deliverer of heavy packages. "If, in our societies, there are thousands of such lieutenants to which we have delegated competencies, it means that what defines our social relations is, for the most part, prescribed back to us by nonhumans. Knowledge, morality, craft, force, sociability are not properties of humans but of humans *accompanied* by their retinue of delegated characters."⁷

Winner hopes to show not only that architecture regulates, but that architecture can be made to regulate; he is quick to imply xenophobic intent (which, considering Moses' other contributions to New York's landscape, is not a hard case to make). Latour speaks more of consequences -- particularly the unanticipated ones. This raises the question of intentionality: must the politics of the

artifact be deliberate? Or, to put it another way, if we discover what we think are political valences in a tool, can we safely assume that they represent the politics of its designer?⁸

It's easier to spot the political valence of technologies that are explicitly designed to regulate. A familiar example is the "panopticon," a prison imagined but never built by Jeremy Bentham, and discussed by Michel Foucault. By designing the prison as a cylinder, with light coming from outside and through each cell, a single jailer at the center could see every prisoner simultaneously. And, the prisoners could not see the jailer, but would know that he could see them; according to Foucault, this would compel prisoners to experience surveillance whether or not anyone was even watching.⁹ The particular design of the prison serves political ends because it forces bodies into lines of sight that effectively discourage unwanted behavior.

Lawrence Lessig points to more familiar examples to demonstrate not only that architecture can govern behavior, but that we quite often use it as a basic regulatory intervention, especially when other avenues, such as the law, are ineffective or costly. We may regulate driving by arresting drunk drivers, enforcing speed limits, and posting cops at busy intersections. But we also install speed bumps and guardrails to force drivers into lanes and control their speed; we put disruptive bumpers between highway lanes to keep drivers awake; and we install automated barriers to ensure that no one pulls in front of an oncoming train, or leaves a parking lot without paying for the privilege. And, we lay out highways in ways that not only regulate the practices of individual drivers, but are massively consequential for the flow of people into and out of, or right by, certain urban neighborhoods.

This attention to the valences of technologies has been taken even farther, to the very structure of human thought. Some critics of cognitive psychology argue that human thought is not contained inside the head, but is stretched across interactions between people -- and between people and things. "Cognition has nothing to do with minds nor with individuals but with the propagation of representations through various media, which are coordinated by a very lightly equipped human subject working in a group, inside a culture, with many artifacts and who might have internalized some parts of the process."¹⁰ Hutchins' points to the nautical chart; more than a computational

device, the chart is an artifact encrusted with layer upon layer of the cognition of past participants: "The cartographer has already done part of the computation for every navigator who uses his chart... The navigator doesn't have to know how the chart was made and doesn't need to know about the properties of the Mercator projection that give special computational meaning to straight lines."¹¹ The navigator is thus engaged in symbolic conversation with everyone who contributed to its construction; cognition literally happens in the space between navigator and chart. And the navigator can only understand the ocean through the features of that tool.

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The resolve of this argument must be regularly tested, since it can so easily sound like a sophisticated version of technological determinism. If the description of the technology is not a subtle one, it will seem as if we are ascribing causality, even agency, to the technology. Determinism remains the dark underbelly of discussions about technology; the sense that technology actively intervenes in the world is a more manageable shorthand for the complexity of the social. Our second concern, then, must be the question of the causality we attribute to the technology. We need to understand the interaction between people as social actors and artifacts as mediated human activity:

We have to hold the two together. Commercial interests, capitalist spirit, imperialism, thirst for knowledge, are empty terms as long as one does not take into account Mercator's projection, marine clocks and their markers, copper engravings of maps, rutters, the keeping of "log books"... But, on the other hand, no innovation in the way longitude and latitudes are calculated, clocks are built, log books are compiled, copper plates are printed, would make any difference whatsoever if they did not help to muster, align, and win over new and unexpected allies.¹²

A look to the artifact must quickly look beyond, to see its engagement with communities of people, cultures of practice, institutional and social contexts, and discursive landscapes.

The Politics of Self-Interpretation

Analyzing digital tools to discover their hidden politics is no simple task; not only do we lack the critical language for it, but technologies, like people, obscure their politics -- in an attempt to appear universal, or natural, or just true. And technologies submerge their politics in the material itself, making them even more difficult to unearth.

One suggestion has been to borrow the lessons learned in the study of literature and art; to do so, we would need to draw an analogy between tools and texts. Woolgar claims that, like traditional texts, the meaning of a tool is a product of its interpretation in a particular context. At the same time, the tool privileges some interpretations over others, inviting "readers" to occupy carefully delineated positions in relation to it. The artifact configures its user by delineating who the user is and attempts "to define, enable, and constrain"¹³ what the use of that artifact will be.

This approach is both productive and treacherous. On the one hand, it helps reveal the meaning-making qualities of the tool -- as in the title of this essay, to reveal the "stories" that tools tell. The risk, however, is a methodological one. Treating the material artifact like a discursive one may tend to highlight the discursive elements of the tool, and further obscure those elements that do not present in discursive terms. And these might be the features we should be most interested in.

This is not to say that a look at the discursive elements of a tool is not productive. In the study of material artifacts, we can find plenty of evidence that the tool is intended for particular uses, and that it presumes the world to work in particular ways, by looking at advertising campaigns, packaging, instruction manuals, company documents, press descriptions, trade magazine profiles, critical reviews. Inside these texts, the significance and meaning of the tool is being interpreted, often by its own designers; this "self-interpretation" of what the tool does and what role it can play inside human activity, frames that activity -- such that using the tool in these ways makes "sense," and other uses and purposes seem less familiar, less likely, less viable. In digital tools, these textual supplements are perhaps even more potent because they seem to be part of the tool itself. For the digital tool, promotional splash screens, help menus, and affiliated websites accessible from within

the application narrate, with similar connotations in how they envision the world in which the tool is involved. And, packaged with the tool itself, it is more difficult to separate them.

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Macromedia Dreamweaver¹⁴ comes with a "guided tour" that introduces its main features. The tutorial is a short interactive design lesson, showing how each feature works on a simulated website under construction. In Dreamweaver 2.0, the mock site is for a fictional gourmet food seller called "Olive Branch" -- selling "delicately aged Asiago cheese" and Two Leaves wine, an "oaky, buttery cabernet"; a sweet and tangy "Ocean Cape Cranberry Mustard" is today's mustard special. The company's mission statement is earthy and cultured: "fresh from our organic gardens to your table, delectables to please the palette and the soul." Nonexistent customers are urged to "discover a world of flavors direct from our farms to your table," as well as to utilize their "secure online ordering" system.¹⁵ In version 3.0, the tone of the site hasn't changed, but the scope is dramatically more global: the site is for "Scaal Coffee," a supposed Stockholm-based cafe that has now franchised, Starbucks-style, into "670 cities around the world." "After all, coffee is a ritual that transcends all cultural boundaries. It makes us feel alert, energetic and alive." The site sells not only the history and prestige of their "brave new world coffee," with its "fresh taste and rich aroma," but also a CD, a travel mug, and a \$3.95 tin of "powerfully refreshing mints." Visitors to this site would be rewarded by a not-so-subtle interpellative sales pitch: "Scaal has been serving fine coffee connoisseurs like you for over 50 years."¹⁶

Both examples are perfectly legitimate, and could easily be real sites. But the choices are also savvy ones, in that they position the tool very carefully amidst an array of possible uses. While the web has been colonized by commercial interests and advertisers, even to this day only a few have discovered reliable ways to Net a profit. Even now, the debate continues about what kind of medium the web will be, how it will be funded, what kind of communication will happen there. And even commercial sites exhibit a range of approaches and purposes: book and music superstores,

journalistic information providers, boutique specialty shops, pornographers, online investors, DiY entrepreneurs, etc.

The examples conjured up by Macromedia make an implicit suggestion to users about what kind of site this program is designed to produce and what the web is for. "Olive Branch" and "Scaal" are commercial sites, vested enough to have secure online ordering. The sites are prestigious and specialized; the products are expensive and posh; the aesthetic is earthy and sumptuous. "Olive Branch" suggests both earthy, old world natural goodness and regal (and commercial) wisdom, while "Scaal" connotes Scandinavian craftsmanship and caffeinated corporate dominance. These choices are deliberate -- a story told by Macromedia about both the use of its application and the Net itself. As their corporate mission statement proclaims, Macromedia is "helping to define what the web can be."¹⁷

And not only is this powerful narration embedded in the tool; this self-interpretation appears during the process of learning to use that tool. This means that its audience is likely to be uninitiated users, new to both Dreamweaver and perhaps to the web. This glimpse into what a website "is" and what its most important features "are" sets an early frame for how these users encounter the web, positing a compelling example even before alternatives can appear. Basing the tutorial on this site does not mark it as the ideal website; it marks it as the "everysite," so common that it can stand in for all sites, for the sake of learning the application.

(If only to prove the point, a search on a major web search engine for the word "scaal" turned up hundreds of sites titled "Scaal Home Page." A few were exact copies of the Dreamweaver tutorial site; presumably, someone was practicing and inadvertently posted the pages to their public server. The majority were actual websites, for different products and interests; it was clear that these users had generated their sites by modifying the HTML code from the tutorial, but had failed to change the title of the homepage. Many of these sites are strikingly similar to the Dreamweaver site in terms of aesthetics and layout, others less so. Most, though not all, were commercial sites.)

The Politics of Design

As I suggested earlier, using interpretive strategies drawn from the study of texts can overemphasize the discursive elements of the artifact. The tutorial may frame the debate, may appear to the uninitiated as the typical site, may subtly emphasize the commercial dimensions of the web, but it cannot functionally constrain use. But Woolgar did not intend to limit our inquiry in this way; he proposed that we interpret the tool itself, its material or structural elements, its "affordances," for the assumptions it makes about the user, the activities it encourages, and the uses it literally makes impossible. This is a monumentally more difficult task, of course -- we are still relatively untrained at articulating how the material elements of a tool themselves have consequences.

All tools have affordances -- hammers are good for forcing nails into wood because of their sturdy and inflexible materials, their flat head, their perpendicular handle, the distribution of weight towards the point of impact. But they are not particularly good for sewing up a wound, for many of the same reasons. The suggestion here is that such affordances shape, urge, and constrain particular uses. More over, this regulation of social practice is not random or idiosyncratic; it is systematic, in that the activities encouraged all tend to envision the world in a certain way.

The caricature of this is to say that hammers see the world as a bunch of things to be driven forcefully into other things. But our concern is much less absurd if we talk about the affordances of a prison. The architecture of a prison is not merely a functional means to contain criminals; it suggests and authorizes a mentality in which enclosure, control, and boundaries have a heightened salience, where the walls that demarcate inside and out stand for all sorts of cultural and moral lines -- right and wrong, just and depraved, human and other. And the particular design of that prison, as Foucault noted, can have additional significance for the practices and presumptions that go on both inside and from without. These affordances are always purposeful, and can typically be validated in terms that justify their presence: safety, security, efficiency. But they have a double life; even as they organize behavior, they also install a worldview by which behaviors they encourage or erase. And while they do not create a mentality in their users -- most people inside of a prison, convict and

guard alike, have come there knowing what the space is about -- they may make it subtly more difficult to envision practices that do not fit these built-in logics once they're inside.

To consider software in this way, we must look at the design of the application itself. When the tool offers a range of choices, we must consider what is left off that list. When the tool works with the hardware in a particular way, we have to uncover the economic arrangements it represents. When the tool anticipates who the user is or what he will likely do, we have to take into account the character of the social world those assumptions represent. And again, these political valences will be hidden, or will appear a natural or obvious element of the technology, or will be praised in the seductive terms of efficiency, simplicity, and empowerment.

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There are a number of design features in software applications we might consider. A look at Microsoft's courtroom battles suggest that the interface between applications and operating systems has real implications for their use -- so much so that the federal government worried that other uses had been rendered impossible. The struggle between the record industry and file-sharing applications like Napster was not only in the courts but in the technology, where proprietary file formats and software filters aimed to select those activities that honored copyright law and the commercial imperatives the industry championed.¹⁸ Here I will focus on interface metaphors, the names given to the functions and features of a software application.¹⁹

Software designers rarely invent words for the various functions they offer a user; more often, the menu of choices is composed of words they assume the typical user will recognize, and that suggest what that feature offers. The designers at Apple certainly chose "cut," "copy," and "paste" for their linguistic familiarity -- and may have designed the features in certain ways to fit the terms. Some applications are designed with a coherent, overarching metaphor, while others are a bricolage of reference points drawn from several domains. Either way, these metaphors evocatively

yet implicitly suggest particular uses and purposes for the tool, and the practices of users will, in subtle ways, tap into the assumptions built into these metaphors.

Interface metaphors are considered successful by designers if they seem "intuitive," and if they help the uninitiated to quickly and comfortably adopt the tool in ways that feel productive to them. But we need to be suspicious about something being "intuitive." Metaphors are not culturally neutral; those that achieve circulation do so because they are consistent with the values of the culture. Furthermore, metaphors reinforce themselves;

metaphors may create realities for us, especially social realities. A metaphor may thus be a guide for future action. Such actions will, of course, fit the metaphor. This will, in turn, reinforce the power of the metaphor to make experience coherent. In this sense metaphors can be self-fulfilling prophecies.²⁰

"Intuitive," then, is often code for whether the metaphor fits an understanding of the world it already structures.

Agre suggests that "metaphors operate as a 'medium of exchange'"²¹ between distinct semantic fields. Their very power comes from the fact that the similarity it claims bridges a significant semantic gap -- every metaphor depends on there being a difference between the two domains. "The crucial element in this formula is the difference that exists between 'the thing' and the 'something else.' What makes a metaphor powerful is the gap between the two poles of the equation."²² In this sense, metaphors are wonderful tools; they take a phenomenon too complex to be understood in its entirety, and name it so that we may evaluate it and put it to use. They are particularly important in the process of learning; "we tend to structure the less concrete and inherently vaguer concepts... in terms of more concrete concepts, which are more clearly delineated in our experience."²³

But if the metaphors we circulate have consequences for how we evaluate the world, then the ones we choose should be judged by the representation of the world they offer. Lakoff and Johnson suggest that, in every metaphor, some elements are downplayed, hidden, and rejected because they do not fit -- "a metaphorical concept can keep us from focusing on other aspects of

the concept that are inconsistent with that metaphor."²⁴ Agre imagines this as a spatial hierarchy of "centers" and "margins": "It is extraordinarily common for a philosophical system to elevate some central category as a 'normal' case, so that the integrity of the system depends on its success in hiding or explaining away the associated marginal category."²⁵ These hierarchical oppositions can be explicit or tacit, but they structure a semantic landscape into near and far that has implications for how the world is perceived. What is marginalized is what cannot be explained; metaphors suggest which features of the world can be named, are worth explaining, and deserve attention.

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In Macromedia Director,²⁶ the user dictates the placement, movement, interaction, and timing of various multimedia elements -- images, sounds, movies, text. These items, stored as separate files in the computer's memory, are incorporated into the program when the user adds them to the "cast." This database keeps track of every imported item available for use in the current project. The elements are visible in a "cast window" that racks them up like yearbook photos. The user must then put these "cast members" on the "stage" -- the window representing the project itself. Cast members can be dragged into place on the stage, or they can be given coordinates and times and will appear on the stage as ordered.

These metaphors from the theater are joined by an array of others in the Director interface, many of which come from other domains of media. The majority of a Director project is designed in three main windows: the "stage" (theater), the "cast" (theater, film), and the "score" (theater, film, music). Cast members are placed onto the score into individual "frames" (film), some of which can be marked as "keyframes" (cel animation) to design character movement. There are "scenes" (theater, film) that can be given "transitions" (film, video). Cast members can be expanded into graduated variations of a single image through an "onion skin" technique (cel animation), combined into a single "sprite" (computer programming) and given movement across frames by "tweening" (cel animation) between keyframes. The project can be viewed in progress using a "control panel"

(video); your place within the score is marked with a "playback head" (video). When the project is complete, it is a "movie" (film) and is shown using a "projector" (film).

Manovich argues that metaphors drawn from existing media have something to offer the digital interface, because their projects are similar. He argues that "each of these traditions has developed its own unique ways of how information is organized, how it is presented to the user, how space and time are correlated with each other, how human experience is being structured in the process of accessing information."²⁷ Each cultural tradition becomes a "reservoir of metaphor" from which the interface can borrow pre-tested dynamics.

Digital media therefore negotiate a precarious relationship of allegiance, rivalry, dependence, and transcendence with the media that surround them. These metaphors establish a structural comparison between the two domains, based on an uneasy tension between similarity and difference, stability and change, novelty and familiarity. This metaphoric comparison highlights some features for comparison while relegating others to the margins. Our perceptions of task and context are structured in part by the metaphors we use and how they narrate the world. Most old media metaphors seem intuitive not because of familiarity of language, but because all these forms share familiar, underlying metaphors and patterns of organization -- offering comfortable expectations for audience, representation, performance, and content.

The "Author" in the Authoring Software

The question then is, how might these choices, and the worldviews they imply, shape and constrain activity when the tool is used? Bolter and Grusin argue that, whichever medium we happen to be experiencing, one of the pleasures is seeing ourselves within and through that medium. "When we look at a traditional photograph or a perspective painting, we understand ourselves as the reconstituted station point of the artist or the photographer."²⁸ This process of identification is nothing new, and has been considered before. But, when a new media "remediates" older media forms, we also must negotiate the different available subject positions inscribed in each.

Our sense of ourselves, and our identification with the medium, is partially structured by the old senses of self associated with the forms being invoked.

The same kind of intersection occurs when producing for a medium. When the tools articulate multiple metaphoric relations, as in the Director interface, users find they must coordinate and negotiate multiple roles. "Cast" and "stage" and "script" suggest the a theatrical production, with us as "directors"; using "keyframes" and "tweening" suggests that we consider ourselves animators, a very different role in the cultural imagination in terms of both status and relationship to the product. Working the "editor" on "pages" and "layout" suggests that we act as newspaper editors; "sprites" and "graphics" may suggest that we are computer programmers; "palettes" and "workspaces" posit us as artists. With this confluence of media metaphors comes a confluence, or perhaps a contradiction, of roles the user is invited to inhabit.

But it's less important to tease out the differences between these implied subject positions, and more important to understand what assumptions they all share; to do this, we can look at how these tools and their metaphors imagine the "author". Multimedia applications such as Director and its competitors have come to be known as "authoring software"; on Macromedia's website, Dreamweaver 2.0 got the same treatment, dubbed a "professional Web authoring environment."²⁹ Here a claim is made about what is being done when these tools are used, and by whom. This is only one articulation of the user offered here; there are others. But it is one situated at an interesting juncture, or disjuncture, between the assumptions about old and new media.

The character of the "author" has a long-standing but complex cultural history, and has come under fire in recent critical theory, specifically in relation to the prominence of digital media. The most common image of the modern author has been of the solitary writer at his drawing table, his nimble mind feverishly conjuring imaginary worlds of his own creation and putting them down on paper for the benefit of all humanity. Even though the act of authorship takes on many forms, very few resembling this at all, the image still enjoys a cultural resonance available to those who produce and encounter texts. Our Western attachment to a robust notion of individualism, our

dependence on identity as a sign of originality and authenticity, and our mentalist theories of cognition converge to reinforce this icon of authorship.

Some new media scholars have argued that digital technologies, especially in their emphasis on collaboration and recombination, expose the fallacy of modern authorship more than previous media. The excitement around the possibility of "interactivity" anticipated a new collaboration between author and reader, where the user has the chance to wander through a landscape of information, rather than being fed a sequence of choices pre-made by the author -- the work itself would be "authored" by both. Digital design seemed to emphasize the mixing and matching of pre-existing and readily available elements, something the more traditional notion of the author minimizes in its valorization of originality.

Both Director and Dreamweaver appear to put collaboration and recombination at the forefront of digital design as they envision it. For instance, Dreamweaver allows for the placement and manipulation of digital objects, but offers little help in creating those objects. There is even an odd silence about where these "objects" are supposed to come from. In one moment of the Dreamweaver 2.0 tutorial, it says "the Objects palette contains buttons for creating various types of objects, such as images, tables, and horizontal rules... clicking a button creates the specified object at the cursor location." But when you "create" an image in Dreamweaver, you are actually only marking the space for an image to be placed. The tutorial later says "to insert an image, click the image button." The verb has changed to one of "insertion;" the tool presumes that pre-existing elements are being recombined, whether they are borrowed from another website, designed with another tool, or scanned from another media source.³⁰

We could argue that these tools, because their affordances privilege collaboration and recombination, will shape design practices in this way and will help transform the practices of authorship. Many have argued that digital technology is doing so as we speak. However, the classic notion of the author has a long cultural tradition, and will not expire so easily. And it is the media metaphors built into these tools that may powerfully curtail this transformation. While the software

seems to encourage an unexpected range of authorship strategies, it dresses those strategies in a language drawn from media forms that have long supported more traditional principles.

It's not clear which is more compelling, the function or its metaphoric name. Perhaps we should pose it as a question: do familiar, old media metaphors help timid users find their way into a dramatically new set of cognitive and communicative arrangements? Or do they translate everything innovative about these tools back into a conventional and conservative set of cultural relations?

To begin to answer this question, we must remember that these tools are part of a moment of transition, as the software industry looks to develop an ever broader consumer base. As computers have become common household objects and the Net has expanded its reach far beyond academics, researchers, and hobbyists, the designers and corporations that create software now aspire to compete with more mainstream media forms. Where tools like these were once designed for users who very much resembled the designers, now they are made for and promoted to a wider consumer audience -- and must resonate with users who do not consider themselves part of this technical design community, and who bring to the table a very different set of assumptions.

These tools must now serve as boundary objects between two different communities, designers and users, and thus must reconcile two significantly different investments in the notion of authorship. Software designers affiliate themselves with the worlds of science and engineering; as such, they often share their opinions about the nature of authorship, which tend to highlight collaboration as much as originality. But these tools now must appeal to users outside of this relatively limited circle. The users they seek are less familiar with or dependent on these distributed notions of authorship. They are likely to assume that "authoring" carries the connotations they know best -- the solitary genius mind that produces original works of art and knowledge.

There is a tension being negotiated here; a design community that embraces a distributed notion of authorship and an open text, using tools that destabilize the more arcane of the cultural assumptions about authorship, finds they must tap those very assumptions in order to distribute that tool and have it resonate with users. This means that tools that might otherwise renovate traditional power relations are marginalized in the very effort to make them available to a wider audience. And

no surprise, this fits the commercial logic of the companies that produce these tools; as much as they desire both the innovation of the new and the status of the old, they must strike an awkward, compromised, and metaphoric balance between those competing impulses.

Conclusion

These tools do not exist in a vacuum. Volti suggests that we think about technologies not as material artifacts, but as "technological systems" with a material artifact at the center. "When technology is seen as a combination of devices, skills, and organizational structures, it becomes natural to think of it as a *system*. For an individual technology to operate effectively more is required than the invention of a particular piece of hardware; it has to be supported by other elements that are systematically interconnected."³¹ Dreamweaver is not a program; it is a tool, a community of designers, an array of users, a medium, a corporation, and series of cultural expectations; its implications can only be made clear once this "system" is brought into focus.

This is a way to remind ourselves that an inquiry into a piece of software may begin with interface metaphors, but cannot end there. And it is also the solution to the problem we began with, of ensuring that never slip back into treating technologies as neutral objects. It was precisely this erasure, of the social and institutional elements that helped us imagine technologies as neutral. Because we drew the boundaries around a technology at its metal or digital edges, we could not see how its affordances were crystallizations of social arrangements, its narrations were the claims and aspirations of its designers and distributors, and its functions were a staging point of a conversation between makers and users about the world they intend to create.

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¹ Weinberg, Alvin M. "Can Technology Replace Social Engineering?" in *Technology and the Future*, edited by Albert H. Teich. (Boston: Bedford/St. Martin's, 2000), 32.

² Bijker, Wiebe E. *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. (Cambridge, MA.: MIT Press, 1995), 288.

³ Winner, Langdon. "Do Artifacts Have Politics?" *Daedalus* 109, 1 (1980): 122.

⁴ Cole, Michael. *Cultural Psychology: A Once and Future Discipline*. (Cambridge, MA: Belknap Press of Harvard University Press, 1996), 117.

⁵ Joerges discusses the way the Moses parable has been mythologized in the literature on technology, noting especially that Moses' bridges may have been that height because of federal statutes, or architectural traditions that nostalgized low bridges as an American tradition. His point is not to discount Winner's theoretical claim, but to note how the intellectual discourse picks and chooses how and why it circulates such "splendid pieces of ready-made discourse" (Joerges 420) as parables. Woolgar and Cooper question Winner's story for its apocryphal power in their field as well, noting that anecdotal evidence seems to suggest that buses did travel to Jones Beach along the parkways. Their task is more epistemological, taking both Winner and Joerges to task for putting too much faith in technologies as definitive artifacts and dismissing their articulation (even their own) as somehow secondary. Instead, they urge a renewed sense of "the essential ambivalence of artefacts" (Joerges, 443). See Joerges, Bernward. "Do Politics Have Artefacts?" *Social Studies of Science* 29, no. 3 (1999): 411-431; Woolgar, Steve, and Geoff Cooper. "Do Artefacts Have Ambivalences? Moses' Bridges, Winner's Bridges, and Other Urban Legends of STS." *Social Studies of Science* 29, no. 3 (1999): 433-449.

⁶ Winner, 124.

⁷ Latour, Bruno (a.k.a. Jim Johnson). "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer." *Social Problems* 35 (1988): 276.

⁸ This is worth leaving as an open question, although we should start by taking particular care about who we assume to be the "designer" of a particular technology. The question of intentionality presumes that an individual can be reliably labeled as the tool's originator, a presumption that deserves some skepticism. It may also be that focusing too much on intent ends up limiting the means for change; when the disabled community sponsored laws requiring

wheelchair access, they did not get far by pointing only at the deliberate, malicious intent of particular architects and designers. It was more compelling to argue that the architecture itself discriminated against them, not the people; making the technology the enemy meant making fewer political enemies in the process.

⁹ Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. 1st American ed. (New York: Pantheon Books, 1977), 195-228.

¹⁰ Latour, Bruno. "Review of Edwin Hutchins' *Cognition in the Wild*." *Mind, Culture, and Activity* 3, 1 (1996): 56.

¹¹ Hutchins, Edwin. *Cognition in the Wild*. (Cambridge, MA: MIT Press, 1995), 173.

¹² Latour, Bruno. "Visualization and Cognition: Thinking with Eyes and Hands." *Knowledge and Society: Studies in the Sociology of Culture Past and Present* 6 (1986): 6.

¹³ Woolgar, Steve. "Configuring the User: The Case of Usability Trials." in *A Sociology of Monsters: Essays on Power, Technology, and Domination*, edited by John Law. (London: Routledge, 1991), 69.

¹⁴ Macromedia Inc. is one of the most prominent producers of such tools, focusing primarily on applications that produce for CD-ROM and online environments. Macromedia was incorporated in 1992 when two existing software companies, Macromind and Authorware, merged; now it's traded on NASDAQ. In the nine months ending December 31, 2001, Macromedia earned \$249.1 million. [Macromedia website, <http://www.macromedia.com/macromedia/ir/> -- accessed January 20, 2002.] That revenue is drawn almost entirely from sales of its design applications: Director and Dreamweaver, as well as Flash, Freehand, Authorware, Fireworks, and ColdFusion.

Introduced in 1997, Dreamweaver marked Macromedia's entrance into the market of WYSIWYG web editors -- "what you see is what you get". Like multimedia presentations, web sites were originally all written in computer code called HTML. But as the web reached a wider audience, a market developed for tools that would bypass the need for HTML expertise, offering users the chance to design web sites simply by arranging text and graphics visually. Programs like Dreamweaver provide the design space and the controls, then compose the HTML to match.

¹⁵ Macromedia Dreamweaver 2.0, guided tour.

¹⁶ Macromedia Dreamweaver 3.0, tutorial.

¹⁷ Macromedia website, <http://www.macromedia.com/macromedia/> -- accessed January 20, 2002.

¹⁸ For more on this subject, see Tarleton Gillespie, "Sleight of Hand: Law, Technology, and the Moral Deployment of Authorship in the Napster and DeCSS Copyright Cases"; dissertation, Department of Communication, University of California, San Diego, January 2002.

¹⁹ I have to note at this point that I am, despite my own warnings, choosing a discursive feature of the technology to analyze; it's possible that I'm falling into the same trap as I noted before, where treating technology like a text *à la* Woolgar leads us to notice the most text-like aspects. However, interface metaphors are, I would argue, fundamentally different than something like a tutorial; the tutorial narrates the tool through example, whereas the interface metaphor literally stands for the function of the tool. Since these metaphors are the only visible element of a feature of the tool, what they fail to represent is, for argument's sake, simply not a part of the tool.

²⁰ Lakoff, George, and Mark Johnson. *Metaphors We Live By*. (Chicago: University of Chicago Press, 1980), 156.

²¹ Agre, Phil. *Computation and Human Experience*. (Cambridge: Cambridge University Press, 1997), 37.

²² Johnson, Steven. *Interface Culture*. (San Francisco: HarperEdge, 1997), 58-59.

²³ Lakoff and Johnson, 112.

²⁴ Lakoff and Johnson, 10.

²⁵ Agre, 43.

²⁶ Director, introduced by Macromind in 1984, was originally conceived as a 2D computer animation tool. But after weak sales, a version 2.0 upgrade in 1990 significantly re-imagined Director as a multimedia design tool for business and education professionals -- particularly by adding Lingo, a scripting language that allowed the possibility of interactivity in the presentations it produced. Director quickly found and dominated its market, just as the CD-ROM seemed to have become a viable medium for business and a consumer market. When the CD-ROM format faltered and the Web came to prominence, Macromedia again shifted Director's focus by developing Shockwave, a plug-in application for web browsers that can present Director projects delivered via the Internet. Macromedia released Director 8.0 in 2001.

²⁷ Manovich, Lev. "Cinema as a Cultural Interface." Available at <http://jupiter.ucsd.edu/~manovich/text/cinema-cultural.html> (1998)

²⁸ Bolter, J. David, and Richard Grusin. *Remediation: Understanding New Media*. Cambridge, MA: MIT Press, 1999), 231.

²⁹ Macromedia website, <http://www.macromedia.com> -- accessed February 18, 1999.

³⁰ Ironically, Macromedia's copy editors caught this incongruity; the language was changed in version 3.0, to "the Object palette contains buttons for inserting objects such as tables, layers, and images." See Macromedia Dreamweaver 3.0, Help menu, "Dreamweaver basics; Object palette".

³¹ Volti, Rudi. *Society and Technological Change*. 3rd ed. (New York: St. Martin's Press, 1995), 5.