Nonhumans Unbound:
Actor-Network Theory and the Reconsideration of "Things" in Educational Foundations

By Scott B. Waltz

The Missing Discourse of Things as Educational Actors

> "The Race War has begun. Your skin is your uniform in this battle for the survival of your kind. The White Race depends on you to secure its existence. Your peoples [sic] enemies surround you in a sea of decay and filth that they have brought to your once clean and White nation. Not one of their numbers shall be spared…" (Resistance Records, n.d.)

This is the ad copy (and only text) on the home page for the first-person shooter game *Ethnic Cleansing.* As the avatar of either a skinhead or a white-robed KKK member, your job is to kill all of the Blacks, Latina/os and Jews that you encounter. This *Doom*-like computer game was developed by Resistance Records, a company owned by the National Alliance, a Neo-Nazi organization that promotes a racist worldview very similar to the one of the virtual world in which you, as the player, are immersed. Educators should certainly be concerned

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about this form of "home schooling," but more to the point, we should be concerned with the ways that this game is helping to construct the social world we are *all* immersed in. The computer game or the game environment, as an entity, is not simply a digital vehicle for racist propaganda and treating it as such obscures the role of the technology in producing effects. Further, in terms of being a sociological entity that produced effects, the virtual world of *Ethnic Cleansing* may not be different, *in kind* or *in scope*, from the ideological worlds so often critiqued in the Social Foundations of Education. These game worlds are not contained, nor neutral, nor passive. Framing them as such underestimates their complex role as social agents. Ethnic Cleansing both is an effect and produces effects, thereby participating alongside other actors in the construction of the social fabric. Game worlds, digital entities and artifacts, in general, are co-fabricators of the socio-political landscape that we live in; yet the field of Educational Foundations does not have a sufficient theoretical language with which to articulate the role of these nonhuman social actors.

As educators, we are surrounded by things: manipulatives, textbooks, lab equipment, educational media, administrative schedules and policy documents, and, of course, the encompassing school physical plant It is impossible to imagine education happening without them. Even writer and philosopher Henry David Thoreau, who eschewed the world of modern industrial manufacturing, surrounded his students with the elements of the natural environment. Yet, as inescapable as things are in the learning process, the Educational Foundations have largely neglected to elaborate a framework with which to take full account of their involvement. This is especially curious given the serious work that has gone into the development and use of things as educational tools. Consider: Froebel gifts, traditional Montessori materials, Piaget's research manipulatives, Skinner's teaching machine (and it's electronic descendants), the "Hunter" lesson plan format, Chris Whittle's Channel One, and Blackboard's™ computer interface. Each of the above is a recognizable, major player in the history of education while simultaneously being a very minor player (in most cases, a mere set piece!) in educational sociology.

Comfortable in a world grounded in sense certainty, positivistic science and Critical/Postcolonial social theory, we in the Social Foundations neglect the relationship between the material and the social. That which is not human is generally regarded as simply present. Much of the recent Social Foundation literature investigates the construction of the social, while seriously limiting the list of legitimate building materials involved. What this literature does not interrogate is the ways in which things are *constitutively social* (Woolgar, 1996)—and that society is constitutively artifactual. The field of Social Foundations sidesteps the fundamental insight that things, both natural and artifactual, are woven into the social fabric and it is difficult to imagine a world where their participation is absent.[1] In *Experience and Education*, Dewey (1997) suggests that if the external conditions of modern civilization, such roads, tools, electric light and power, were removed "... our experiences would lapse into that of barbaric people"(p. 39). For Dewey, experience and the social milieu arise not out of a relationship of dependency upon the material, but one in which persons,

things, systems and texts exist in a complex relationship where each is responsible for the construction of each, i.e., that experience is built out of interaction.

Other areas of study in the field of Education are better at accounting for the involvement of things and persons. The arrangement of classroom space is a topic in every Elementary Methods course and a constant concern for practitioners and administrators. Questions of digital interface and the inhabitation of cyberspace abound in studies of educational computing. Yet discussion about the active role of things in the (historical) fabrication of the social world is quite rare in Social Foundations classes. With the exception readings from Foucault's *Discipline and Punish*, school architecture, for example, is not a topic one would find on a Social Foundations syllabus. Similarly, the very crux of Kozol's famous impressionistic argument in *Savage Inequalities* is his attention to the physical plant; yet, the *active* role of the facilities in constituting, perpetuating or changing the social context of schooling is neglected. This has not always been the case. The late 1960s and 70s saw broad experimentation with school architectures and related issues. Reading the articles on these innovations, one is struck by the many ways in which the structures and spaces insert themselves into the educational process. The following observation by educational architect John Holt (1974) is worth quoting at length.

> The best school, architecturally, that I ever saw or worked in was not designed as a school at all. It was the Commonwealth School in Boston, which is housed in two old houses, tall and narrow, five floors and a basement, joined together at every floor to make one building. From the point of view of almost any school architect, the building is a disaster, full of "wasted" space, "unusable" space—stairs, stair landings, little corridors, closets, bathrooms, tiny rooms too small to use for any recognizable school purpose. And *those spaces, as much as anything else, have been the making of that school*. In and on those stairs, landing corridors, and corners, students meet, study, talk, argue, and dream. The tiny closets and bathrooms have been made into private studies, which the older students sign up for and decorate in various personal and eccentric ways. One student filled a bathtub with cushions and made that her reading and study space. …We would have to worry a lot less in our schools about "motivating" children, about finding ways to make good things happen if we would just provide more spaces in which good things could happen. (p. 670) [my italics]

Practitioners and policy-makers are generally aware, in both articulated and unarticulated ways, of their educational environments, but the field of Social Foundations has not noted that in a penetrating way and begun to think about how it is that persons and things are involved with one another in the Educational world.

This aim of this paper is to call attention to the missing discourse of non-humans as social actors in the Social Foundations of Education. The paper outlines three common figuring metaphors that impede the adoption of such a theoretical discourse and shows how Actor-Network Theory (ANT), more recently developed in the nascent field of Science and Technology Studies (STS), reframes sociological theory—and specifically, what it means to be a "social actor"—to allow for a more comprehensive accounting of the interactions of humans and nonhumans in

the fabrication of the social. A corollary aim of the paper is to highlight the role of nonhumans in contemporary educational concerns. To this end, the paper offers a range of different examples to illustrate its points. Technological innovations will continue to, and perhaps increasingly, play a role in the shaping of the educational landscape and the Social Foundations would both extend its theoretical reach and increase the thoroughness of its research efforts through a more careful consideration of the role of nonhumans in the fabrication of the social world.

Three Limiting Figurations

In large part, the reason that educational sociology disregards or underestimates the role of things is because it treats nonhuman entities as categorically different from human ones. The natural and artifactual world are opposed to and separated from the world of human-to-human interactions. Sociality is severely differentiated from materiality.[2] The Enlightenment conception of the individual subject and Durkheim's subsequent constructions of social behavior, validated within the Positivistic tradition of scientific inquiry, have inscribed a division between the observing and the observed that continues to structure educational thought and research. To the extent that human interaction is categorically different from interactions with the material and natural world, the participation of nonhumans is not only secondary, but also considered outside the realm of the traditionally sociological.

Because the natural and artifactual remain subaltern or exterior to the inherent sociality of humans, discourse surrounding their participation in social dynamics has becomes trapped within three dominating figurations. The most common treatment of the nonhuman is the sheer lack of treatment in social accounts because things are treated as mere *objects* and therefore not accorded any social agency. In this case, things may be acknowledged, but are not investigated with regard to their active contributions, per se. When nonhumans are factored into sociological discourse, they are often framed within one of the other two dominant metaphors. Either they are subordinate (though not always obedient) *tools* serving human aims or, by contrast, primary movers and therefore overdetermined agents of change.

As mentioned above, the most common theoretical attitude towards things, by far, is disregard. Although educational artifacts are noticed, they are not considered integral to the general educational program. Artifacts remain interesting set pieces, but not participatory, *interested* actors. The history of education in the United States is rife with famous material figures—McGuffey's Readers, Fordist seating architectures, evolving playground equipment, video technologies and more recently, the Internet—yet, their involvement in social events, beyond that of simple products, remains largely unarticulated. Even in the historical narratives, they are often eclipsed by the famous human figure or socio-historical trends; the things themselves make an appearance only as insular, and largely passive, objects

Consider the role of assistance dogs in library read aloud programs. In 1998, Intermountain Therapy Animals launched a reading program in Salt Lake City called

READ (Intermountain Therapy Animals, 2006). The organization found that having children read aloud to dogs could improve the children's readings scores in part by providing a non-threatening atmosphere for practicing literacy skills. The dogs also benefit from the work. It gives them purpose, company and physical affection (children like to pet the dogs as they read to them). It is all too easy to see this event as merely a new iteration of something educators are well aware of: that reading aloud to an encouraging listener can improve a student's self-efficacy and therefore increase their literacy. In this formulation, there is little happening that is new and the canine participant, as such, is rendered virtually invisible. The highly trained dog becomes the equivalent of a stuffed animal.[3] What this formulation misses is the very thing that made this program a newsworthy article in *The Sacramento Bee* (McGee, 2003). In 2003, the Orangevale Neighborhood Library was making appointments for children to read with Sal, a Labrador-golden retriever working on behalf of the READ program. The appeal of the news story grows out of the realization that in his own way, Sal was an educator—as the headline proclaims: "Dogs' new trick: Help kids read." The story title here is not a clever hyperbole; it is attention getting precisely because it indicates that learning is happening (differently) because of all that Sal brings to the situation. Assistance dogs contribute to educational growth through their own natural assets and professional training. As an assistance animal, for example, Sal is patient, attentive, warm, furry and responsive. Furthermore, they have formal training that makes them better at reading assistance than other dogs, and, apparently, most people. In fact, the animal's efforts as a teaching assistant meet a number of the Teacher Performance Expectations required of teacher candidates by the California Commission on Teacher Credentialing (2001). The dog's activity indicates competency in promoting student engagement (TPE 5), use of instructional time (TPE 10), and creating a growthful social environment (TPE 11). If assistance dogs like Sal are viewed simply as the object of the read aloud, a description of the interactions remains terribly one-sided and the uniqueness—and success—of this educational setting is missed.

When things *are* more carefully figured into education accounts, they are commonly framed as transparent representatives of human interactions, i.e., as tools or vehicles. Lewis Mumford (1934) provides a classic articulation of this figuration as he lays the groundwork for his own mediations on technology and society:

> In the back of the development of tools and machines lies the attempt to modify the environment in such a way as to fortify and sustain the human organism: the effort is either to extend the powers of the otherwise unarmed organism, or to manufacture outside the body a set of conditions more favorable towards maintaining its equilibrium and ensuring its survival. (p. 10) [4]

Similarly, the particular artifacts that help make up The Educational Environment—that most ubiquitous and generic of creatures—are rarely considered beyond their status as equipment enabling human ends. Contained by human intention, be it user, designer or manufacture tools remain an extension of, container for or

reliable iteration of the work that people do. This is not to say that they unerringly follow human design, but that their status as tools is defined by it. Educators and researchers are particularly quick to frame up new technologies as useful, subservient objects. For example, in everyday talk (and more subtly in the academic literature), it is a common strategy to ease one's fears of a technology's growing capabilities by pointing out that: "After all, it is just a tool." This is meant to allay concerns about effects because those effects are wholly contingent upon the use of the technology.

The extent to which educational things are addressed as tools they deflect analysis because they remain simple, circumscribable objects. As equipment, the nonhuman entity simply refers back to the person, group or institution that puts it to work; it is analytically subsumed by human intention, design, or drive. In treating nonhumans as representatives of human ends, their particular contributions are obscured—as are the complex ways in which they interact with humans in the constitution of social events. As tools, the role of nonhumans is limited to extension, transportation, distribution or prevention, all of which tend to hide the unique qualities of the entity itself. Burbules and Callister (1997) refine this critique with regard to Information Technology in education, pointing out that artifacts tend to reshape people's perception of self, relationship, organization and goals in ways that disrupt and redistribute the ends to which artifacts are perceived to be the means. Furthermore, they note that framing technology as a simple means prevents the acknowledgement and analysis of the very real "unintended consequences" that arise. In other words, nonhumans introduce their own effects and as such exceed being mere tools. Marshall McLuhan brought the attention of an entire generation to this fact with his famous dictum "The medium is the message." The aphorism was startling to the extent that it points *back* to the unique contribution of the medium as itself an active player in, and not merely as the transparent audiovisual vehicle for, broadcast content. The same applies to all nonhumans. Things are not mere stand-ins; they surprise us and require new ways of interacting with them even as they find new ways to interact with us.[5] However, to begin to take an accounting of these interactions, the tool metaphor must be overcome.

Take, for example, the course textbook. The common perception of the textbook is as a convenient print container for the knowledge distributed in a course. Textbooks are created to pass along certain configurations of canonical learning and textbooks are sought out and used as ordered and more or less comprehensive repositories of such knowledge. To this extent, textbooks remain mere objects and can be largely disregarded beyond their ability to retain and transmit what is given to them. This is apparent in the discourse surrounding the multicultural content of textbooks. The volumes themselves serve only as the index of proportional representation of various social groups. They are research objects whose own particular contributions remain hidden. Similarly, the critical theorists who have explored the relationship between state agencies and textbook companies still frame them as mere vehicles for the political agenda of capitalists and conservatives (Apple &

Christian-Smith, 1991). Disregarding the contributions of artifacts in this way prevents the drafting a more careful articulation of their involvement. Textbooks, in fact, seem to be very particular and versatile actors. Publications such as McGraw-Hill's highly scripted *Open Court Reading* series actively contribute to a number of different ends, including: determining effective pedagogical tasks and the sequencing of those tasks, aligning district-wide curriculum and underwriting administrative assurances that students are being prepared to pass the required local, state or national standardized tests, to name just the most obvious. Textbooks in higher education can also limit academic freedom and demand that students make decisions about taking out loans, getting an extra job or constraining outside spending. Furthermore, the lack of textbooks can index the deprivations of urban education. It is not at all clear that this variety of effects is subsumed by human aim, intended or not. Depending on the situation, i.e. the other actors with whom they stand in relation, textbooks may become not only tutors and study-buddies, but also co-conspirators, law-enforcement officers, administrators, racists, quality-control agents, seducers, and investment advisors. Critical theory has brought to light *that* textbooks are involved in issues of control, but not *how* they play a role in those sociological dynamics, how they fold back into political dynamics, or what their particular (and unexpected) contributions are.

The third dominant discursive figure is the characterization of things, themselves, as the *primary* drivers of social interaction. In the form of technodeterminism, this took its most extreme form in the work of Jacques Ellul (1964) who envisioned the proliferation of technological processes as its own kind of manifest destiny, threatening to increasingly reduce the social opportunities for humanizing moral deliberation and decision-making.

> "Technique elicits and conditions social, political and economic change. It is the prime mover of all the rest, in spite of any appearance to the contrary… External necessities no longer determine technique. Techniques own internal necessities are determinative. Technique has become a reality in itself…" (133-4)

In its more mundane form, technology is simply (and often, implicitly) attributed with the ability to establish the parameters for contemporary or future social intercourse. Over the past twenty years, discourse surrounding the Internet has been especially replete with claims that this or that new technology will revolutionize commerce, community-building, teen culture, or democratic participation. Whether technophilic or technophobic, narratives of contemporary developments in devices, digital communications, cybernetics, and informatics regularly characterize the technology as *the* determining agents of social interactions. This sort of mythologizing has the same effect as treating nonhumans with a categorical disregard, as mentioned above. It inhibits a more careful accounting of how nonhumans interact with the full scope of other participants with which it is involved. Framing things as primary drivers tends to divert an analysis of things as historical products, projects whose very bounds are themselves determined by the local setting.

At root for all three of the discursive figurations described above is the fundamental differentiation of the material from the social. The maintenance of a Material/Social dichotomy not only creates a categorical barrier, but encourages the valuation of one term over the other. The disregard for material actors, the objectification of these actors and the overdetermination of them preclude more careful theoretical and empirical inquiry into the ways in which the persons and technologies are involved with one another in the construction of the social. In the case of the Social Foundations, this may appear acceptable. One might note, after all, that the field is identified as "Social" Foundations, which means that that consideration is primarily focused on patterns of interaction among persons. However, upon closer inspection, it appears quite rare that such patterns are free from the active and constitutive participations of artifacts, technologies and the natural world.

From Empty Vehicles to Networked Actants

Actor-Network Theory (ANT) is rather unique in its theoretical and methodological treatment of nonhumans primary because it does not begin with the assumption that things are categorically different from humans. There is no a priori supposition that persons are endowed with intentionality and nonhumans are not. Rather, ANT approaches the local situation under study with a primary interest in how participants are *associated* with one another, i.e., the way in which actors "*make others do things*" (Latour, 2005, p.107). To the extent that either things or persons provoke an effect, they are treated symmetrically.

> The success of ANT is to have overcome the descriptive resistance to divisions between technology and society, and everything that follows in relation to things and persons. In actor network theory, anything mobilized in the course of actions is an actor/actant: they are all potential agents." (Strathern, 2000, p. 175)

It is not that actors are qualitatively leveled or that things are given status equivalent to humans; rather, ANT precedes any attribution of status or category or import with an investigation of the interactions that constitute events. All contributors to an event producing effects—whether they are artifacts, plants, animal, texts or humans—are given equal consideration. Borrowing a term from semiotics, ANT refers to contributors as *actants*. As such, their role is primarily one of function rather than content; actants only later become actors as they are specifically configured as such by particular events or strings of events. In other words, entities obtain a status, i.e., become particular figures, in the course of events and prior to those events their existence may be distributed differently (Latour, 1991). The term *actant* also disrupts the idea that actors or agents are defined by the quality of intention or causality.[6]

ANT's attitude of analytic symmetry towards humans and nonhumans, in part, arises from its family connection to the field of Science Studies, in general, and the Sociology of Scientific Knowledge (SSK) in particular, although this idea also has roots in Latour's own earlier work (1993). The general purpose of such an attitude

is to employ a more "scientific" approach to scientific knowledge, itself, in an effort not to privilege the terms that tend to dominate the construction of scientific knowledge and distinguish it from the social sciences, e.g., truth (fact), validity, rationality, objectivity (Bloor, 1975). Instead, ANT approaches the difference between Nature and Society as, itself, an historic construction and one that seriously limits a careful accounting of events if applied a priori. In fact, the launch of ANT as a developing body of ideas can be traced back to the three particular studies (Callon, 1986; Latour, 1984; Law, 1986). Each author in these respective works realized that by painstakingly charting the empirical associations between parties, without predetermining kinds of actors or scope of influence, they could develop a very precise description of events that did not involve recourse to unobservable underlying structures or dynamics such as "natural behavior" or "economic forces". These studies then lead to further ideas and research grounded in the fundamental epistemological insight that the complexity of relationships is as founding to the unfolding of events as that of "causal" entities. In fact, entities themselves owe their existence as such this unfolding.

Although the parentage of ANT was interested primarily in matters of Science, Callon, Latour, Law and others immediately knew that without the categorical division between Nature and Society, their developing ideas and methods were also already interrogating what is circumscribed within other fields of science such as Sociology, Anthropology, Religion and Economics. In more recent writings, Latour (2002) further points out that ANT is, in fact, *retuning* to the original insights of the early sociologist Gabriel Tarde, a contemporary of Durkheim. From this perspective, ANT is a renewal of a theory of associations that traces back to the historical beginnings of sociology as the study of that which is assembled together—as opposed to the more modern study of the dynamics and structures of human relations. Because ANT approaches human and nonhumans symmetrically and does not follow Durkheim or Weber in the a priori categorical differentiation of humans and nonhumans, it illuminates the ways in which nonhumans make contributions beyond that of tools or ideological projection screens. All contributors remain accountable within the historical and local interactions in which they are deeply embedded.

ANT provokes traditional Sociology to rethink its assumptions about the Material/Social divide and thereby take seriously the ways in which the developing associations among humans and nonhumans shape events. For ANT, the social fabric is woven out of the continuing interactions of actors as evidenced by observable performances of each. Methodologically, this means that humans as well as nonhumans are tracked as they shift action to create, advance or frustrate some collective struggle or *program of action* (Latour, 1991). When research draws first on the performances involved in social interactions rather than disregarding contributions based on categorical prejudice, then it produces a richer articulation of the social weave. For example, in her volume *Gender Play*, Thorne (1994) describes the gendered territories of the school playground, where girls tend to occupy the monkey bars in contrast to the boys who claim the playing fields. However, what

the description of gender construction here does not address are the ways in which the playground geography and equipment, themselves, play a role in that divided occupation. How do particular recess play areas combine with children's behaviors to shape gender identities? How does the equipment advance or frustrate the social program of distinguishing genders? Would schools with garden "playgrounds" instead of ball fields and monkey bars influence how children gathered and interacted? How does the particular geography play a role in adults' definition of gender, itself? If artifacts and natural environs are considered alongside persons as social actors, then one gains a more precise and complex view of how both humans and nonhumans contribute to excluding, inviting or regulating "gendered" participation. The field of inquiry both broadens and becomes more particular when the subject of the question shifts from persons to contributor. The general empirical question becomes: How does the particular complex of actions among children and equipment give rise to the fabrication of gender on the playground?

The video game *Ethnic Cleansing* in the opening paragraph of this article was treated as a social actor for the purpose of illuminating the powerful influences of artifacts in the construction of the social and not simply passive vehicles for human behavior. However, it is now apparent that nonhumans are not humans by another name. The performance of things and persons are not prioritized or categorized as such because the construction of the social lies in the ways actors gather together not in their inherent, individual "agency." By carefully observing the pushing and pulling, separation and joining of efforts, one can trace how the social comes to settle out as such. *Ethnic Cleansing* is a gaming software environment; it would not exist if code was not compiled and it was not packaged, marketed and distributed as a game. If its figuration as gaming software, one can track it effect. However, it is also an effect itself; Ethnic Cleansing settles out as a game by virtue of the impact of other actors such as the WWW home page mentioned earlier that announces it as a game and provide a gateway for obtaining copies of the software. With different presentation or in a different container *Ethnic Cleansing* might become simply as an informational tract. Its status as an actor can be traced across other actors and back in time just as it can be carefully followed alongside contemporary actors and into the future. Its genesis, maintenance and breakdown as a figuration—which is to say, as a thing—can all be traced and recorded.

Returning to the study of gender, ANT methodology allows—in fact, demands—that nonhumans as well as humans be followed when investigating gender differentiation in schooling. That which we call a *boy* or a *girl* is the combined effects of a network of actors that are gathered for the determination of these two figures, with nonhumans playing an important role in this program. Playground equipment and geographies are only part of the picture. Other more proximal nonhuman actors include apparel, organ structure, bodily comportment and adornments, and speech. However, they also recognize (themselves as) a *boy* or a *girl* by the bathroom they enter and how their locker is decorated. In some older school buildings the gender differentiation is cemented over the school entrances, with one doorway marked

"Boys" and the other doorway marked "Girls." At these locations, children had to recognize themselves as one gender or the other before they even physically entered the school. Learning to read these signs and lining up accordingly, then, furthered the program embodied in the masonry. Because ANT frames gender identification as an effect rather than a category, it can include the influence of nonhumans and record the what and how of their contributions. *Boy* and *girl* are *assemblages* (Akrich & Latour, 2000) whose construction within public education can be followed.

Recognizing the importance of performance, however, does not yet equip one to carefully trace how it is that these numerous influences align to describe the accomplishments of the various, networked actors. To help detect the progression of the program of action, Latour and other Actor-Network theorists speak of *translation* or *delegation* (Latour, 2000). When an action performed by one social actor gets taken up by another, that second actor determines the shape, direction or fate of that action. The earlier actor actively delegates the work of the program to it successor. To the extent that the second actors, and its companions, continue the same work, the aim is extended in length and/or breadth. In this way, the links between social actors become an additive chain, which advance the program or *script* (Akrich & Latour, 2000). However, each actor, be it human or nonhuman, will express the action differently according to its own capacities, constraints and location among other actors. Because things (and persons) are not merely vehicles or projection screens, the analyst can track specifically how each actor translates the actions passed along to it. The delegation or translation may entail extension and to that degree, the program is maintained. However, it will likely also involve a change to the program and to that degree the program is altered or reformed. In some cases, the delegation may turn out to work directly against a particular aim, making that actor part of the *anti-program*. Pursing the translations in this manner involves the articulation of the particular performances of actors rather than treating them as invisible or hollow. Each actor can be taken into account—must be taken into account—for the qualitative smithery performed rather than the quantitative degree of noise or distortion they introduce. Each nonhumans, in particular, cease to be an *intermediary* that "transforms meaning or force without transformation: defining its inputs is enough to define it outputs." (Latour, 2005, 39) Instead, it becomes a *mediator*, who's "input is never a good predictor of their output; [whose] … specificity has to be taken into account every time." (39)

Thorne's script (1994) already provides a detailed accounting of how the human actors contribute to the maintenance of gender differentiation. It is a rather straightforward task to also include the nonhuman actors to follow how they advance, modify or work against the fabrication of *boys* and *girls*. Because the network Thorne describes is not a temporal progression, links will be made and actions delegated across actors. The chains or network would be depicted as additive in breadth, rather than length. Thorne records how children are separated and identified by teacher address, e.g., "Boys and Girls…"; teacher queuing practices; students' elected seating arrangements as they share lunch; and student recess play areas. Drawing on

Sadker and Sadker (1994), we could also include student classroom behavior and teacher attention patterns as nodes in this network. To these nodes, we can add the nonhumans: playground geographies and equipment, separate labeled bathrooms, apparel, etc. Close attention to the interactions described already by these researchers and further empirical observation in these settings would reveal the particular ways in which each actor translates the set of actions it is involved in. Apparently, all of these contributors tend to perform the work of separating students into boys and girls, but a closer examination of each one would reveal the particular manner in which this happens as well as accompanying modifications or branchings that occur. As indicted above, different actors, such as a garden playground area, frustrate gender differentiation and participate in its anti-program.

Naturally, along any set of linkages, the action might follow other aspects of the network to create, extinguish or join with other programs. Because any particular interaction can lead to the redistribution of work to other sets of actors, and reflexively, that any particular interaction is constituted by the programs that historically lead up that event, ANT applies the term *network* to describe the actions and configurations of these associations. Networks are built out of interdependent nodes and differ from trajectories in that any node represents a possible redistribution of the action. Unlike a trajectory, the success of the program is played out *through* the social links and is not a predetermined pathway. A program is not a potentiality waiting to be actualized. Network can be descriptively traced, but not frozen in time as linear, causal formulas. Furthermore, networks include their own production in their set of association. Any description of sequences that chart the constitution of the social world is always an interested one. The researcher's perspective and authorship emphasize some sets of relations at the expense of others. For this reason, Akrich & Latour (2000) employ the term *script* as a synonym for translation, to further account for the influence of the analyst in the described chain of social links. The scribe is also a node in the network. Of course, the chain is not wholly determined by that interest. Social relations play out in a world that provides resistance to the free play of interpretation and the author's work must be accounted for in its effects just like all the other actors.

ANT suggests that these networks figure the actors who, in turn, create further linkages beyond merely describing the array of interactions whose interplay fabricates the social world. Social actors, be they human or nonhuman—semiotic, material or hybrid—are always entities that are incorporated, brought together by and made-up of a prior array of interactions. Actors are also translated. The length of the social chains out of which they are constituted guarantees their enduring existence as entities. ANT predicates actors on their interactions, rather than accepting agents whose power to act is grounded in an ontological category. Performance and event become the atomic unit and things are understood as always themselves distributed across a network.

For Heidegger (1971), when we represent a thing before us as a separate object, or an empty vehicle, we annihilate it. We downgrade it from a participatory

thing worthy of inquiry to a material footnote, a mere object. Heidegger notes that etymologically, the root meaning of thing has to do with matters of concern being under deliberation. In Heidegger's language, a thing is as a *gathering-appropriating staying*. In other words, things are not the simple entities that sense certainty and the tradition of positivistic science may lead us to believe they are; instead, nonhuman participants are always involved with and delimited according to their relationships with other humans and other nonhumans. ANT draws on this fundamental insight as it describes actors as that which is gathered as a node in the network of associations. Treating nonhuman actors as gatherings is simpler in reference to the entities of traditional sociology, such as gender, discussed above. It is more challenging to symmetrically address "material" artifacts in the same manner or to bear in mind that for ANT, "social" entities are not categorically different from those that most appeal to sense-certainty.

Returning to the textbook example, educational historians claim to trace a history of "the" North American textbook from Colonial hornbooks to the Open Court series today; however, this would be a crude representation. This lineage is not simply one of differing iterations of the same *thing*, a textbook. What a textbook is, as an artifact, is a historical assemblage that endures as/through the translation of further assemblages. Noah Webster's early speller as a standardized text of progressive lessons was explicitly linked to the work of cultural unity, nation building, quality assurance and pedagogy. School textbook series today are explicitly linked to financial efficiency, educational accountability, diversity (arguably) and collecting primary sources. Although some of the performances of the textbook are the same, others have changed in significant ways. In addition, digital media and the popular use of the Internet have created a new battleground for the determination of this artifact. The textbook as a source of reliable information may be reconstituted in surprising ways or even disappear entirely in the face of accessible, public databases and pedagogical web interfaces. What a textbook *is* today is quite a different thing than what the McGuffey Readers were a century and a half ago. The changing constitution of actors in the networks follows the changing social chains that link those actors, and as such includes and constitutes individual persons, social groups, financial networks, material artifacts, evolving technologies, and "natural" agents.

Because entities draw their being from the competencies that come to be defined by their interactions and not as essential subjects already categorically sorted according to their attendant abilities, they obtain social agency from the social relation in which they are entangled and not as some prescribed quality. In other words, the existence of a participant and the role carved out for it or him or her arises out of the network and therefore does not discriminate things from persons from institutions from machineries from signs. Or rather, the discrimination, itself, is determined within the historical interplay. For ANT, agency is not a quality to be ascribed to ontological status, but as an effect of social chains, an attribute of the assemblage. The distinction between things, persons, or signs is much less

important, theoretically, than the performance they provide and the incorporated social effect that is their constitution.

As actors, persons are not categorically different from things. Both are social actors fabricating the social world in conjunction with a variety of other social actors. Because performance in the social links is the basic unit of construction, educational analysts can and must broaden their accounting of important participants and be deeply skeptical (and deeply curious) about the construction of each actor's part as well as how it is played out. In terms of a research program, this means being more observant and less biased with regard to the associations that inhere in the events under investigation. Consider, once again, the computer game *Ethnic Cleansing*. The extent to which *Ethnic Cleansing* acts to help build the socio-political landscape could be articulated by an extensive description of the networked associations. Rather than beginning with an analysis of how ideological constructions inform the game-play (and thereby limit the discursive envelope to the discussion of those constructs), a researcher might carefully observe the particular competencies of the involved actors, human and nonhuman, and thereby gain a richer understanding of this technological artifact and how it also plays a role in any number of other social projects. For example, linked with a xenophobic news stream about the Iraqi occupation, *Ethnic Cleansing* may provide a catharsis, an ability to kill the other psycho-emotionally, but not physically. In this way, the game play takes on the actions of a trained therapist or a like-minded peer group, or a heated public argument or an afternoon at the firing-range. Connecting the game play to late adolescence, oppositional parents and contact with a welcoming branch of the National Alliance community and the game play is a recruiter, and one that the potential member continues to return to and learn from on his or her own. The game play becomes an effective disseminator of propaganda. Compare the ease of reproduction and the financial rewards of distribution with the time, effort and money required to do the same thing with evangelical humans. In fact, the game play, as entertainment, generates as much pull for the product as market push of the same. The consumer becomes a willing sales associate for Resistance Records. However, if the social circumstances change, the performance of the game may change also. For the Anti-Defamation League, the game takes on a symbolic value and becomes the focal point of an object lesson on racism (Anti-Defamation League 2002). Along the same lines, in the hands of a capable high school Civics instructor, the game play itself becomes its own critique of anti-Semitism and the ways in which "entertainment" media perpetuates (not so subtly) social injustices. Here the game play is linked with the teacher, the curriculum and the institutional mission of the school to become a co-instructor. Linked further with a problem-based, constructivist pedagogy, the game play takes center stage as the learning facilitator.

The limited list above indicates the kind of thick, empirical, performative and multi-directional description of networked actors that the Actor-Network research approach supports. This approach is tuned to the particular interactions as they combine to support social projects and to create surprising, new arrays. Moreover,

Actor-Network theory acknowledged the active role of the nonhumans as actors in the co-fabrication of the social world.

An Inclusive Social Foundations of Education

Drawing on the co-constitution of participants and networked relations, Latour, and others who write within what Pickering (1995) has referred to as the *performative idiom*, provide analytic tools for a more precise and inclusive accounting of social events, an accounting that does not begin with a categorical distinction between humans and nonhumans. Artifacts, technologies, architectures, animals, and text are recognized as participants acting alongside persons, groups, and institutions in the continuing fabrication of the social world. This broadens our view of the range of social actors and relationships that constitute any given collective and thereby provides for an expanded sociological democracy. It may be the case that animals and objects have always been socially constitutive, but this is particularly so today as computing, communications and transportations technologies (not to mention the growing development of nano-and bio- technologies) contribute so apparently to cultural change.[7] Take, for example, the American Anthropological Association's (1998) Statement on Race. Their conclusions regarding the exclusively political basis for the concept of race are supported in large part by genetics research, work that could not happen without an extensive array of scientific equipment and a communications networks. More to the point, the genetic material, the physical human characteristics, the scientific lenses, the research agendas, the interpretive modeling, the textual records, *and* the human actors were all active participants whose specific interactions shape the production of knowledge, politics and culture.

As combinatory and historical rather than essential or multiple or fractured, sociotechnical networks illuminate all of the actors in the dynamic ways that they help fabricate social events. Because the work of the actors—which is to say their interactions—is as important as their status as actors, the accounting is released from the categorical blinders that accompany such agents. Because "actors take shape in interactions," nonhumans are as free as humans to participate in the deeply historical and radically specific way in which cultures are transformed (Selinger, 2003, p. 69). Furthermore, in large part because Latour and his peers are coming out of the field of Science Studies, they are describing a sociological program that is designed to illuminate and support careful, empirical research. Unlike Critical and Post-Colonial Theory, for example, ANT lays the groundwork for a productive description of the sociotechnical links grounded in the careful observations of researchers and the particularities of textual records (Latour, Mauguin & Teil, 1992). This kind of exacting empirical work bring to light what is already rather obvious in everyday interactions: we traffic as much, if not more with things as we do with other humans.

The Social Foundation of Education, as a field, is preoccupied with the political relations among and within particular social groups, specifically those relating to race, class, gender, sexual orientation, language and popular culture. The discus-

sions of power relations, however, whether Functional, Critical or Post-Colonial, have already determined who the appropriate actors are. This prematurely closes down inquiry into the historical and continuing construction of those entities as well as the ways in which nonhumans are part of the political process. These privileged social agents are not only blackboxed, but all other nonhuman actors are categorically relegated to being mere objects, tools or prime movers. They are deprived of recognition for the particular ways in which they shape interactions and contribute to social invention. Attentiveness to new assemblages, – including the roles of both human and nonhuman actors, would open the field of Social Foundations and better tune it to new and surprising developments, e.g., how race does or does not endure as a social actor[8] or how animals are reinvented as educators or educators are reinvented as cyborgs. The Social Foundations of Education as a field would greatly broaden its theoretical view and enrich its research endeavors by embracing a sociology where the construction of culture and the circulation of power is not something that happens by nonhumans or through nonhumans, but in our inescapable relations with them.

Notes

[1] For an insightful elaboration on how baboons are social and how that sociality changes with the introduction of language, symbols and material things as negotiating elements of the social order, see Strum & Latour (1987).

[2] On the possible variation in this relationship, see Law & Mol (1995).

[3] The metaphor here is used for its dramatic value. It is not meant to underestimate stuffed animals as actors. The entire World of Pooh and the role it plays in defining childhood is proof that button-eyes companions are also powerful social actors.

[4] In the opening chapters of *Technics and society*, Mumford (1934) presents an abbreviated taxonomy of the Machine along these lines. It provides an early elaboration of the metaphors that have come to structure this rhetoric.

[5] For more on how this works out with regard to laboratories and scientific discovery, see Pickering (1995).

[6] Although *actant* is introduced here, this paper will continue to use the more gross term *actor* to refer to sources of social action.

[7] For more on how dogs were involved, prehistorically, in helping humans shape their mutual social organization, see Haraway (2003).

[8] Gloria Ladson Billings in her keynote address for the 2004 Annual Sociology of Education Association Conference (Asilomar, CA) spoke about her continuing wrestling with and frustration regarding a definition of race. Here is a response to her implicit question.

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