

Title of Paper: **On the Lack of Human Inscription in Digital Design Processes**

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Brief Bio

- **2007 – 1985: Associate Professor, Architecture Program, Georgia Institute of Technology**
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On the Lack of Human Inscription in Digital Design Processes.

- **Why**

The motivation behind this paper stems from the sedimented experience and frustration of teaching architectural design for twenty-five years. The prevalent model of instruction is based on an embodied approach to design which starts with the designer and ends up in a set of drawings drawn with the aid of a human body and a building built also with the aid of human bodies, the scope of which is to address and serve human bodies. Structurally the model comes full circle, and the common trace that unites all of the points of this continuum is a human being conceptualized either as a dichotomy between body and spirit or as a holistic unit comprised of both. The visible and perceptible traces of this bodily involvement in the conception, design, and construction cycle of buildings, be it actual or metaphorical (as in the case of anthropomorphism), constitute the notion of human inscription.

Today, this continuum is being disrupted and in many ways jettisoned by the advent of digital media and design computing. My thesis is that this movement is not altogether negative, but it becomes problematic the moment it wittingly or unwittingly suppresses or totally erases human inscription.

In addition, we are also creating a distance from the empathic way of conceptualizing buildings and objects relative to our own bodies through a series of metaphors and projections. We are allowing these changes to take place at a frenetic pace without considering the consequences that come with them. It is also quite disconcerting to realize that once we abandon certain practices, it is almost impossible to go back to them. The loss of skills and understanding of methods of representation, especially as they pertain to geometry, is something I have witnessed while teaching design studios over the years. What seemed at the beginning as a series of innocent and convenient omissions has now become an inexorable trajectory.

- **How**

Architectural representation happens on a vector that involves the conception of a project, the design process, and, finally, the construction technologies and methods employed. All of these stages involve the participation of humans as authors, technicians, and users. The role of the human beings involved in these stages can be clearly identified and described within the traditional means of architectural design and production. Design and construction are related in clearly analogical ways that are based on embodiment. Conversely, I will argue, human inscription is mostly lacking in projects that are conceived and implemented through digital media. In this case, the analogical link between design and construction is either weak or nonexistent, and one can identify a distinct lack of embodiment.

Dalibor Vesely writes in reference to architecture, “The future of the discipline, as it now appears, depends on the conditions and circumstances of situational embodiment which have been left behind or ignored. The dilemma becomes a paradox when we realize that to create a space in which human activities could be embodied and situated was always the main task of architecture.”¹

I want to make it very clear at this point that my position is not one of nostalgia, of seeking to turn the clock back, nor is it one of polemic against what has been called the “digital revolution”, with all of its potential and seduction. I am not pursuing an “either/or”, but a “both/and” position. In this instance my intention is to draw attention to the fact that the current propensity to do away with the body and the embodied approach to knowledge, experience, and information is not just due to the zeitgeist or to some random epistemological shift, and that a series of economical, political, power and psychological motivations can be identified behind the veil of the digital “neo-neo avant-garde”.

- **Hidden Agendas**

The change in direction toward the digital came to my college in the nineties as a dictate from above. It was the “new thing” and we had to “get with it” or else. The obvious interpretation was that if we, as faculty, lagged behind, the school would suffer, and so would we. We would be behind the times. The irony that zeitgeist, a phenomenological construct, was offered as a reason for us to move away from experiential and phenomenological ways of teaching and practicing design is still lost on most of us. The information superhighway was being built and we had to get on it. Behind this somewhat benign reason there were other forces at work, however. The University and the College of Architecture are overcrowded, and we always face space issues. The solution envisioned was that by requiring the students to use a computer for their design work, we could actually house twice their number in the same spaces. With the advent of networking the students were to work remotely from home, further decongesting the spaces. Finally, we could offer instruction on the web, decongest our spaces and increase our revenue. This is how the state’s economy translated itself into a narrative of disembodiment. The more students we have working on computers and not using their whole bodies to design, the better off we are. At the time software manufacturers were willing to give their programs to the students for free, ostensibly to help them with their studies, which further encouraged the university in this transition since it suspended a lot of our reservations related to cost. In reality, they had done studies that proved that the students, upon entering the profession, showed a significant bias toward the first software that they had learned.

Finally, the issue of employment came into the picture. Both students and their parents burdened by tuition were demanding that the students be taught the latest skill that would guarantee them immediate employment. Needless to say, when it came to the students as prospective employees, the architectural firms of the region were placing similar demands on us. The fact that this resulted in a new category of pawns in architecture firms, pejoratively called “cad monkeys”, should be the subject of another study. Finally, the advent of computing and digital media freed up time in the curriculum for the introduction of newer areas and topics. There is always the pressure to graduate employable students in as short a time as possible with the result being a continuous editing and re-shuffling of the curriculum. This is a financial viability race against other institutions of higher learning that pursue similar goals in curtailing the duration of education and thus increasing its affordability. The character of the university is changing from one that was influenced by the values of the Enlightenment to one that is more and more similar to a for-profit corporation².

- **Embodied Design**

First, I would like to quickly illustrate the process of embodied design and construction practices, and then I will follow with a similar description of the digital processes in order to trace their differences, similarities, and relative advantages through a formalist lens. The major criterion I am using is the known tenet of formalism as it has been inherited from the Russian Formalists and transformed in the West by Clement Greenberg in painting and by Kenneth Frampton in his arguments about tectonics and architecture. Simply put, formalism relates the medium and its idiosyncrasies as they are manifested in the work produced. A secondary distinction that I am employing has to do with the use of geometry and, more specifically, whether it appears as an intelligible or a perceptible presence in the design. My premise is that the use of geometry in the traditional, embodied paradigm is both intelligible (the designer and user know its rules and can identify its presence) and perceptible when it appears in the disembodied digital paradigm³.

In traditional instruction and design practice the designer uses a series of relatively simple tools, namely a compass, a ruler, and a triangle, in conjunction with Euclidean geometry and orthographic projections, a sub-set of which is perspective. These geometries are both intelligible and perceptible. In drawing different shapes and forms, one is forced to use one's body in imitation of the shape to be drawn. A long line requires the hand to trace it in its entire or partial length against a ruler, a circle requires a twirling motion of the compass, and an ellipse requires knowledge of the geometrical ways that one can employ in its construction. Line weights are being used to signify sections through materials, projections, etc., and the weight of the line is proportional to the pressure exerted by the body on the lead. One has to learn when it is appropriate to draw with the elbow, keeping the wrist immobile, and when it is appropriate to draw with the wrist. Dashed lines require a rhythm. Horizontal lines are parallel to the horizon and to the earth's surface, and vertical lines are parallel to gravity, while both are parallel to the edges of the paper. All drawings are scaled, and the measure of them is the human body. Especially in the imperial system of measuring one can always guess with relative accuracy the length of a foot by looking at one's own body or by pacing a room. The body is literally the measure of the building, and Le Corbusier underscored this point in his writing as well as his buildings. Large buildings or tall buildings require that the designer use his or her whole body to reach the far ends of the drafting table in a way that is analogous to the arduousness of negotiating such big horizontal and vertical distances. Doors, openings, bathrooms, and all kinds of spaces are drawn with the dimensions of the human body in mind. If the student does not know how to draw a stair, measuring one and looking at his or her body and the way it acts on a stair is sufficient. When the time for construction comes, a similar sequence takes place. We find the inscription of our bodies in the buildings, in the construction materials, in the spaces and functions, etc. Even bricks, aside from their other material properties, are dimensioned in such a way that a human hand can easily grab and lift them. Their weight is proportioned relative to the capacities of the human body so that a bricklayer can be fully occupied for the duration of a day without becoming exhausted early on. Our bodies, our tools of design and construction, and our habitation of buildings are all related together in a seamless continuum. In addition to this, we project our bodies in our buildings, and in a reciprocal

way, we project buildings on our bodies. The metaphors that project bodies on buildings or the inverse abound. Even perspective drawings are related to our body in the sense that geometry is employed to imitate, to inform, and to replicate the mechanics of human vision. It should be obvious at this point that this list and the resulting insights produced could fill many pages. What interests me here is to provide enough evidence to reveal the indissoluble tie that binds our bodies, our tools, and our designs. The knowledge of the requisite geometry resides with the designer, and the tools are simple and belong to the designer as well. There are no copyright issues and the system remains relatively stable without requiring additional training.

The unifying conceptual and practical framework that facilitated the circular process that united the body of the designer with the body of the user was based on Euclidean geometry and on a system of orthographic projections. In its original Euclidean iteration, the design process involved in the conception, representation, and construction of the built environment could be reduced to two simple tools: a compass and a ruler. An infinity of forms and shapes could be thus produced. What was so fascinating behind this model was that once an individual learned the rules and theorems of geometry and with the utilization of two tools, she or he was free to exercise his or her profession. Body and mind were all the tools needed. This model was emancipatory in the sense that it allowed the individual to own the processes and tools involved in his or her profession. And, it should be noted, the same tools on a larger scale were used for the construction and the execution of design. All of this material and semiotic production was the product of human bodies finely choreographed in space and time.

- **Disembodied Design**

Design Computing brings to the fore a whole set of different techniques and assumptions about the function and role of design and its relationship to humanity. A major distinction needs to be made relative to the different uses of computing in design. We can identify two major trajectories. The first tends to confine the use of computers to the traditional model. They are seen as “just another tool” in the process of traditional architectural practice because they facilitate the production and the archiving of architectural drawings. Because the Internet facilitates the transmission possibilities of files and folders, and the incorporation of details from external sources, it helps increase profit margins.

The second, more substantive use, which is the one that I am engaging here, has to do with the approach that makes substantial use of the properties of the computer and is formalist in its core. In this paradigm the designer uses and purchases software that comes with a lot of legal and pragmatic restrictions of use because of copyright. The software and hardware change quite frequently, making older systems both obsolete and cumbersome, thus requiring continued retraining and expenditure. The complexity of the systems is such that no one designer can effectively know the internal workings of the computer, the workings of the software (which is a result of multiple authors over long time periods), and have the requisite knowledge of architecture, human behavior, etc. needed to exercise his or her profession. The result is that design requires more and more teams of experts, and that big parts of necessary knowledge belong to different individuals and entities. This fracturing is reflected in the notion of embodiment itself.

We are dealing with the convergence of disparate disciplines whose job is to provide enough coordination for the production of a viable design. All this happens while we are put in a position of always trying to come to terms with the new technologies. Furthermore, in order for all of these systems to work together, experiences, bodies, occupations, knowledge of building and designing, all the requisite components of design, have to be equalized and made transmissible by their conversion to information.

The emphasis here is on the word “information.” It is the key to the new paradigm, the signifier without signified, the promise of scientific objectivity. It has the agility to travel between digital media, between spaces and times as something seemingly immaterial, and it does away with the cumbersomeness of the analog as it conveniently converts everything to ones and zeros. In the frenetic attempt to stay relevant and current we accept it as a premise without realizing the consequences. For one, machines and computers handle information much more efficiently than human beings. The fact that the notion of “information” is an abstraction, that to convert anything to a binary sequence entails a certain loss – music connoisseurs prefer analog recordings to digital – escapes us. The irony that information eradicates meaning is lost on the individuals that propose the primacy of information as part of essential, meaningful progress.

This paradigm happens to be espoused by architects and designers that identify an evolutionary change precipitated by computers and digital media, one in which humanity will cede its position to the machines of its own creation having understood once and for all their supremacy. James Steele writes, “Rather than computers being the tool that we use to create the built environment ... we become their tools, or more accurately, we become one with them.”⁴ Not only will we be replaced by a code, but we will also achieve immortality in the machine after having stored our person in digital format on a hard drive⁵.

The obfuscation of Euclidean geometry and other methods of representation behind the software one is using goes hand in hand with the narrative of the expulsion of the body in design processes. In terms of organizing space and the production of shapes and forms, the geometries available to the user of digital media are almost infinite and extremely involved. The results can also be extremely, beautiful, and different. The geometry behind these designs is perceptible but not necessarily intelligible. NURBS (Non-Uniform Rational B-Splines) and other complex curvatures are possible in the digital realm, and their construction and manufacturing is becoming more and more feasible through the utilization of design files in processes of automated and digital manufacturing. The complexity alone makes the notion of embodiment quite impossible since human bodies cannot always negotiate and inhabit the forms produced. But in all of this there is a price we pay. Along with the production of singular form we also resort to digital media for the drawing and conceptualization of simple geometries (the nomenclature used is “primitives”, and its pejorative intent is quite obvious).

- **The Price**

It is easy for design curricula to omit geometry and orthographic projections, as they have. The students rely blindly on the medium and distance themselves more and more from the conceptual, intellectual and other components of their profession. Even in the case of writing, when confronted with their spelling errors, the standard answer is

“Spell-check didn’t catch it.” With the advent of the immense complexity made possible by digital media we are fooled into believing that, except for the new opportunities offered, nothing else really changes. What happens is that we get so accustomed to this new reality that we passively use the computer as a repository of information and knowledge that we are perfectly capable of handling ourselves. CNN last year published on its Web page a commentary regarding US students and their drawing skills, stating that “U.S. art students spend so much time toying with computer graphics these days that many wind up without needed drawing skills,” and they mention that “tech-savvy students simply lack the initiative and persistence developed by drawing, resulting in uninspired work -- at least work on paper.”⁶

And as we jettison this knowledge from our minds, we also jettison the notion of embodiment because we are now convinced that none of this is really necessary. Instead of fostering creativity and expanding our minds in ways made possible by our cognitive prostheses, we are running the risk of becoming passive, lulled by the apparent seduction of our products that in the end has nothing to do with us. Both means and product reside outside the purview of the body. A reminder of the secondary role our bodies play in digital design is that we have to stay transfixed in front of a computer monitor, zooming in and out of a drawing where the trade off is between looking at a detail with the rest of the design absent, or looking at the whole design in a condensed, pixilated, and conventionalized way.

Katherine Hayles writes, “Information, like humanity, cannot exist apart from the embodiment that brings it into being as a material entity in the world; and embodiment is always instantiated, local and specific. Embodiment can be destroyed but it cannot be replicated. Once the specific form constituting it is gone, no amount of massaging of data will bring it back.”⁷

In front of an auto-cad drawing our bodies need to learn another way of coordinating our limbs. Efficient users use the mouse with their right hand and type commands with their left hand. These commands are abbreviations of the nomenclature used by the software. Furthermore, the significance of line weights and line types is obfuscated behind the convention of numerous layers that help organize information in terms of systems. The spatial information conveyed by lines in conventional drawings is further complicated by a new convention that assigns different colors to different lines on different layers. The designer has to remember continuously the choices he or she made and translate them into spatial information. The riddle is resolved at the end when line weights and line styles are defined for the final iteration of the drawing, which is plotting. So a large amount of our mental faculties are also engaged, not in creative ways, but ways that are required for software to do its own work.

In addition to all this, there are the overzealous who want to imagine a future without embodiment but also without humanity. In this instance, the entire sensorium of the human being, human experience, and the phenomenology of being in a designed environment are all reduced to simple information, to a binary code of “yes” and “no”. Since our machines can obviously perform calculations and process information better than we do, we are obsolete, and in this techno-Darwinian frenzy we can proclaim with glee our own obsolescence.

The question of ownership comes into play when digital media are introduced in the process in many complicated ways. In the past, most of the performative knowledge that belonged to us was stored in our bodies. The moment we rely primarily on hardware and software we enter into a complex financial and power relationship with physical, digital, legal, and power bodies that are external to ours. Software and hardware change quickly, and we are obliged to learn how to use them. We are thus forced to adapt to this external reality that is financially motivated, whose reasons for being are not ours. We also rely on technicians who specialize in troubleshooting our machines, our networks, and our software, and they are the ones who hold our tools and prostheses hostage. In other words, once we make the choice to fully espouse digital design, we have unwittingly traded in our immediate and personal agency. All this because we have fallen prey to our desire for increased ease of use and for the promise of even more complex designs and buildings.

This question of ownership is particularly salient in an academic environment since it signals a transition from a model where the knowledge imparted had as its final owner and recipient the student, to one where knowledge belongs to software companies that choose what information to include in their packages as they remain sole proprietors of the contents, even after having sold the software. The student owns the transient skill of being able to use these programs.

- **Back to the Body**

This issue of ownership comes into play in a metaphorical sense as well. Renderings that are directly produced by digital media are not favored by the public. People tend to feel alienated and excluded from the images thus produced. Even firms that have firmly rooted their design production in digital media are obliged to hire skilled artists that produce renderings conducive to human projection. The touch of the hand, evident in the abstraction of the drawing, the numerous human beings inserted into the scene, the vegetation and finally the visually secondary role of the building are all semantic clues planted into the image, signifiers of humanity as presence and emotion.

Now that it is under attack, the notion of embodiment seems to be gaining some momentum. Mark Johnson and George Lakoff have defended it as the *sine qua non* of human knowledge and understanding by making the distinction that only through an embodied understanding do things become meaningful: “What we understand the world to be like is determined by many things: our sensory organs, our ability to move and to manipulate objects, the detailed structure of our brain, our culture and our interactions in our environment, at the very least. What we take to be true in a situation depends on our embodied understanding of the situation, which is in turn shaped by all these factors. Truth for us, any truth that we can have access to, depends on such embodied understanding”.⁸

This whole description of the ways things become meaningful to us is closely related to the way embodied architectural design has been and is being taught. We can find some consolation in the fact that we can still anthropomorphize simple abstractions and be touched by them. The phrase “Desperate loneliness of parallel lines that never meet”⁹ is a reminder that our bodies are still speaking to us.

¹ Dalibor Vesely, 'The Humanity of Architecture' in *Architecture and Revolution*, Neal Leach ed. (London and New York, Routledge, 1999) p.143.

² Bill Readings, *The University in Ruins* (Cambridge: Harvard University Press, 1996) passim.

³ Harris Dimitropoulos, *Digital Formalism: Representation and Geometry in Electronic Media*, Unpublished paper delivered at the Hagley Museum of Art and Technology in 1998.

⁴ James Steele, *Architecture and Computers: Action and Reaction in the Digital Design Revolution* (New York: Watson-Guption Publications, 2002) p.55.

⁵ Otis Port, 'Carnegie Mellon: Aiming for Immortality' in *Business Week* (June 23 1997) p.99.

⁶ CNN website, CNN.com, *Design software weakens classic drawing skills* (April 5 2006).

⁷ N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: The University of Chicago Press, 1999) p.49.

⁸ George Lakoff and Mark Johnson, *The Embodied Mind and its Challenge to Western Thought*, (New York: Basic Books, 1999), p.102.

⁹ Umberto Eco, *The Mysterious Flame of Queen Loana* (New York, Harcourt, Inc. 2004), p.6.