

## CYBERPRINT: TOWARD AN ARCHITECTURE OF BEING

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### Keywords

*Performance, Data Visualization, Interdisciplinary, Virtual, Architecture*

### Abstract

This project involves the design, construction and performance of an “architecture of being” that expresses selfhood in virtual space and real time using: (1) physiological data as its building material, (2) architectural design as its expressive intent, (3) digital space as its medium, (4) screen projection as its enveloping and viewing technique, (5) user interactivity and performance as its partner, and (6) interdisciplinary collaborations among Architecture, Choreography, Modern Dance, Music, Bioengineering, Medicine and Computer Science as its creative and technical contexts.

The paper presents the implementation of the cyberPRINT during a series of techno-media performances at the Rose Wagner Performing Art Center in Salt Lake City, USA, in May 2000. This work is believed to be the first of its kind in the world. The cyberPRINT is building a new area of creative inquiry in Architecture by means of collaborations with the Arts and Sciences.

### Background & Significance

Since time immemorial humans have attempted to graphically represent themselves to themselves in the belief that this visual externalization of their physical and/or psychological being may help them grasp who or what, why and how they are. The prehistoric cave paintings, the history of portraits and masks, medical imagery, surrealism, and lately cyberspace avatars are all representational attempts with the same origin (Ellis 1993, Feher et al 1989, Sennett 1994, Stafford 1991, Sterlac 1995, Wentwick 1971).

Scanning such imagery across time, space and cultures reveal a wide range of visual metaphors for expressing identity and life. And yet, despite their diversity, they all sooner or later, directly or indirectly refer back to the body as their foundation and inspiration (Frank 1995, Johnson 1987, Lacoff & Johnson 1998, Merleau-Ponty 1963, Valéry 1989).

This project is inserted within this ancient tradition as it explores the visual depiction of the self and the body in the light of the arising new technologies and media. The focus is the graphic representation of a “becoming self”, that is, the creative expression of being in time. For millennia such jobs have largely fallen under the responsibility of the “performing arts” (Music, Dance, Theater). The “visual arts” through their use of still images and objects could only limitely express the changing nature of vital phenomena. If the adventment of film changed some of this, it didn’t impact Sculpture and Architecture which remained “trapped” in what made them unique: their permanence and materiality. It was not until the invention of the computer and its off-spring digital space that these restrictions were finally lifted,

thus unleashing the untapped creative potential of Sculpture and Architecture to address the fleetingness of being.

This work takes on this challenge by designing, building and performing an “architecture of being” that expresses the fluidity of the self/body in real time. The virtual architecture is generated using actual physiological signals from a human body and by transforming them into 3D forms and spaces in real time. Since the resulting artifact re-presents the individual whose biological data generate and sustain it, it is a “cyberPRINT” or personal signature of that individual in digital space. By enveloping its user through screen projection and/or virtual reality technologies, the cyberPRINT makes that individual visualize, inhabit, and interact with themselves and others in hitherto unimaginable ways. Participating in this new type of architectural experience provokes profound and lasting aesthetic and reflective responses in all those involved, users or viewers.

But, what does Architecture have to do with the business of representing the self and the body? Architecture has always been concerned with providing shelter, identification and an enhancement to human existence. Discussions regarding personal space, individuality, the body, and their relationship to architectural design abound. The design of a fluid construction standing for the self in digital space would be only an extension of this tradition. And yet, it is also quite radical a departure. For instead of asking Architecture to determine human activity, the cyberPRINT literally makes human activity determine Architecture. The result is a complete reversal of the way we have hitherto interacted with and created Architecture. Form follows life . . .

The relevance of Architecture to address virtual environments and beings is also supported by the leading minds in the architectural field (Anders 1999, Benedikt 1991, Mitchell 1995, Negroponte 1995). In fact, it is precisely this area that is beginning to occupy the most imaginative individuals in the discipline. So far the work has focused in addressing the seemingly “anti-architectural” qualities of the virtual: immateriality, non-gravity, fluidity, spatial discontinuity, multi-dimensionality, etc. (AD#133 1998, Chu 1998, Davis 1996; Novak 1995, 1998; Möller 1996). What has been missing from these efforts is attention to the central role that the body plays in the conception and perception of virtual architectures (Beckmann 1998, Frank 1998). By addressing this shortcoming, the cyberPRINT not only assures its creative uniqueness but also opens untapped opportunities.

The use of the body to drive music and media events is not new in the contemporary performing arts addressing electronic environments (Davies 1999, Dominguez 1997, Novak & Sharir 1994, Kisselgoff 1998, Schiphorst et al 1994, Sharir & Salen 1997). However, these works have been constrained by choreographic strategies (e.g., interest in sound, lighting, local effects, limited interactivity) with little attention to the potential of immersive and interactive 3D visual environments. Producing and performing the cyberPRINT offers a whole new type of performance.

Methodology

Given its uniqueness (i.e., there is no precedent of this kind of work) the cyberPRINT presented numerous artistic, design, computing, media, and conceptual challenges. This demanded major interdisciplinary collaborations among Architecture, Art (Choreography, Modern Dance, and Music) and Science (Bioengineering, Medicine and Computer Science).

Practically, the cyberPRINT obtains its raw material from non-invasive and integrated medical sensors registering vital signs in real time in numerical data format. We utilize the BioRadio 110 made by Cleveland Medical Devices Inc. to accomplish this task (<http://www.clevemed.com>). The BioRadio 110 is a lightweight programmable wireless physiological monitor for measuring and recording EEG, ECG, EMG, EOG, and PSG signals. By eliminating the restrictions encountered with traditional tethered equipment, the BioRadio allows the individual being monitored the freedom to move about naturally, something essential for the type of performance required by the project. The BioRadio 110 sends the measured data via radio signals directly to a PC where it is then processed by an especially written software to generate a virtual architecture according to design prescriptions. The necessary technology to make all this works was developed by a team of people from Architecture, Medicine, Bio-Engineering and Computer Science.

The BioRadio 110 is used to collect data input registers the activity of three physiologic functions historically associated with human life (1) Respiratory and muscle activity; (2) Cardiac activity; the heart and its functions; and (3) Nervous activity; the brain and its workings. Since physiological data can be represented in any way within digital space, the focus of our work was in the design of the visual-temporal prescriptions guiding the transformation of the incoming data into visualizable 3D representations of the three functions described. This meant to develop:

1. new aesthetic conventions, rules, and techniques for visualizing the body and the self in digital space (i.e., syntax and vocabulary);
2. the relationship between design intentions, and the expectations of the performer and audience (i.e., the world of meaning: semantics);
3. how to employ and develop a design to elicit aesthetic responses (i.e., pragmatics).

The project heavily draws from an area of architectural knowledge called "Basic Design". This specialty area consist of basic principles (e.g., scale, shape, rhythm, balance, color, tectonics, structure, etc.), elements (e.g., line, figures, objects, space, etc.) and organizational rules (e.g., hierarchy, layering, typology, symmetry, etc.) of 2D and 3D design and their relationship to human psychology and behavior.

### **Aesthetic Questions**

The cyberPRINT addresses, among others, the following questions: Can the self be expressed in virtuality beyond mere cartoonish or literal representations? How do thoughts, emotions, and movements appear in a technologically mediated world? What is an "architecture of being"? Can we use architectural languages to visualize human life? Is there an aes-

thetic logic for expressing an enveloping environment of change? What is the aesthetic result of the visual interactions between real and virtual selves? How do Architecture, Modern Dance, Music and Choreography fuse into one performance? What methods, languages, technologies, and knowledge work as common ground among them and how do their differences help to spark new insights?

For a longer and more theoretical and philosophical discussion on this topic or about the cyberPRINT, please refer to other papers by the authors (Bermudez et al 1999a, 1999b, and Gondeck-Becker et al 1997)

### **The Performance**

The cyberPRINT was first publicly performed during "Body Automatic Body Resistant", a techno-media event directed by internationally renown multimedia choreographer and artist Yacov Sharir (University of Texas professor) and commissioned by the Repertory Dance Theater as part of its 1999-2000 Millennium Season. The 9 shows took place in May 2000 at the Rose Wagner Performing Arts Center in Salt Lake City, Utah, USA. The specific goal for this event was to express the new performing opportunities afforded by contemporary technology and media in the context of an interdisciplinary collaboration among Choreography, Modern Dance, Music and Architecture.

In addition to Yacov Sharir, Tom Lopez, an Electronic/Interactive Music Composer from Oberlin College (OH), and Amarante Lucero, a University of Texas at Austin Engineering Professor and Lighting Designer and Robotic Lighting Programmer provided with important sound and lighting contributions to the performance of the cyberPRINT.

During the event, choreographer Yacov Sharir was connected to the cyberPRINT generator and thus created a self-sustaining feedback mechanism: Mr. Sharir's performing environment was the architecturization of his own body physiology in the music context played by Tom Lopez. . . Sharir inhabited and interacted with the cyberPRINT by dancing, constantly changing his vital signs and thus keeping alive and continuously transforming his own "architecture of self". Modern Dance, Choreography, Music and Architecture became an altogether new artistic expression! Both the performer and the audience experienced the cyberPRINT through large screen projection technology. Please, refer to the still images of the performance.

### **Future Direction**

Based on the learning experience of our first set of performances, the project will move to the creation of a public installation in which ordinary people will experience their own CyberPRINT. As a fully interactive and participatory work, the cyberPRINT will make an artist of everyone by default, as they will effortlessly generate their own fluid architecture. By bringing this, their "architecture of being" into existence, the cyberPRINT will challenge people's perceptions about themselves and their unfolding condition. Interpretations ranging from the erotic to the spiritual will fill the reading and participatory space of the installation. A digital recording of a participant's fleeting digital signature

would be saved to a computer disk or videotape for later playback, thus maintaining the possibility for new interpretations.

### Illustrations

Figure 1. The physiological sensors of the BioRadio 110 being placed on the body of choreographer Yacov Sharir prior to the performance.

Figure 2. The physiological data generated by Yacov Sharir's body are measured and radio transmitted to a PC where they are used to construct the virtual architecture or cyberPRINT.

Figure 3. The technology in action. In the first plane Yacov Sharir is connected to the BioRadio 110; behind him (blurred by the flash of the camera) is the cyberPRINT projected directly from the computer where the data is transformed into a three-dimensional visualization.

Figures 4 to 11. These images are video captures of the implementation of cyberPRINT on 2000 May 13 in the Rose Wagner Performing Arts Center in Salt Lake City, Utah, USA.

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### References

- AD Profile No.133 (1998) *Hypersurface Architecture*. New York: John Wiley & Sons, Inc.
- Anders, P. (1999) *Envisioning Cyberspace*. New York: McGraw-Hill
- Beckmann, J. (1998) *The Virtual Dimension*. New York: Princeton Architectural Press.
- Benedikt, M. (1991). *Cyberspace, First Steps*. Cambridge, MA: The MIT Press.
- Bermudez, J., Agutter, J., Foresti, S., Westenskow, D. & D. Gondeck-Becker (1999b) "Visualizing the Unseen Body. Architectural Potentials of Data Modeling", in XII Brazilian Symposium on Computer Graphics and Image Processing — SIBGRAP'99, pp.61-63 and cover, UNICAMP, Campinas Brazil
- Bermudez, J., Agutter, J. & D. Gondeck-Becker D. (1999a) "CyberPrint: Unfolding the Nature of Being", in Proceedings of the 7th Biennial Symposium for Arts and Technology, New London, CT: Connecticut College, pp. 16-19
- Gondeck-Becker D. & J.Bermudez, (1997) "Cyberprint, Toward an Architecture of Being"; paper presented at the 8th. International Symposium on Electronic Art (ISEA'97). Chicago, IL
- Chu, K. (1998) "Genetic Space"; A.D: Architects in CyberspaceII, vol.68, no.11-12, pp.68-73
- Davis, E. (1996) "Osmose"; *Wired*, Vol. 4.08 (August) pp. 137-140, 190-192
- Davis, C. (1999) "Ephemere: Landscape, Earth, Body, and Time in Immersive Virtual Space", in Roy Ascott (ed.): *Reframing Consciousness*, Portland, OR: Intellect Books (pp.196-201)
- Dominguez, D. (1997) "Trans-e-my body, my blood" (Interactive Installation), ISEA'97 (Chicago) and GAU'98 (Universidade de Caxias do Sul, Brazil)

Ellis, S. (1993). *Pictorial Communication in Virtual and Real Environments*, Washington, DC: Taylor and Francis

Feber M. with R.Naddaff & N.Tazi (Eds.) (1989) *Fragments for a History of the Human Body (Part Two) — Zone 4*. New York: Urzone Inc.

Frank, K. (1995) "When I Enter Virtual Reality, What Body Will I leave Behind?", in A.D. Profile #118: *Architects in Cyberspace*, pp.20-23

Frank, K. (1998) "It and I. Bodies as Objects, Bodies as Subjects", in A.D: *Architects in Cyberspace II*, vol.68, no.11-12, pp.16-19

Johnson, M. (1987). *The Body in the Mind. The Bodily Basis of Meaning, Imagination and Reason*. Chicago, IL: The University of Chicago Press

Kisselgoff, A (1998) "Barysbnikov at City Center", *The New York Times*, B1 & B27 (January 23)

Lacoff, G. & Johnson, M. (1998). *Philosophy in the Flesh*. New York: Basic Books

Mearlau-Ponty, M. (1963) *The Structure of Behavior* (Boston: Beacon Press).

Mitchell, W. (1995). *City of Bits. Space, Place and the Infobahn*. Cambridge, MA: The MIT Press.

Möller, C. (1996). "Interactive Architecture"; *World Architecture Vol.39*, pp. 146-151.

Negroponte, N. (1995). *Being Digital*. New York: Alfred A. Knopf.

Novak, M. (1998) "Next Babylon, Soft Babylon", A.D: *Architects in Cyberspace II*, vol.68, no.11-12, pp.20-29

Novak, M. (1995) "TransTerraFirma"; in *Sites*, Vol. 26, pp. 34-53

Novak, M. & Y. Sharir (1994) "Dancing with the Devil", *Virtual Reality performance done at the Banff Centre for the Arts, Banff, Canada* (May)

Schiphorst, T., S. Mab & J.Crawford (1994), "StillDancing: Interacting Inside the Dance", performance piece done at the Fourth International Conference on Cyberspace. The Banff Centre. Banff, Canada (Collected Abstracts, p.21)

Sharir, Y. & K. Salen (1997) "Cyber Human Dances Series: Design and Collaboration in a Virtual Space", performance at the 6<sup>th</sup> Symposium for Electronic Arts and Technology . New London, CT: Connecticut College.

Sennett, Richard (1994). *Flesh and Stone. The Body and the City in Western Civilization*. New York: W.W.Norton & Company

Stafford, B.M. (1991). *Body Criticism: Imaging the Unseen in Enlightenment Art and Medicine*. Cambridge, MA: MIT Press.

Sterlac (1995). *Towards The Post-Human. From Psycho-body to Cyber-system*. A.D. Profile #118: *Architects in Cyberspace*, pp.90-96

Valéry, P. (1989) *Some Simple Reflections on the Body*, in M.Feber with R.Naddaff and Nadia Tazi, eds., *Fragments for a History of the Human Body (Part Two) — Zone 4* (New York: Urzone Inc.) pp.395-405

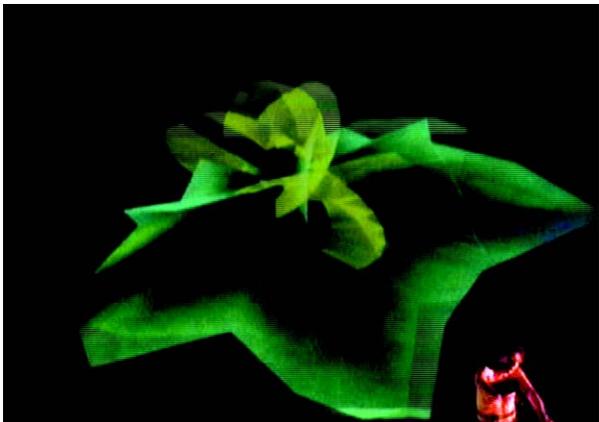
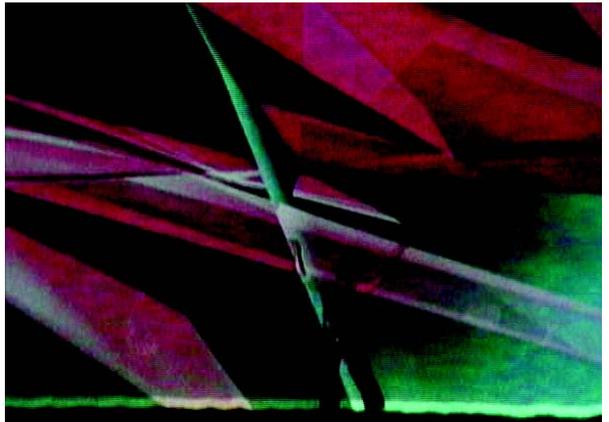
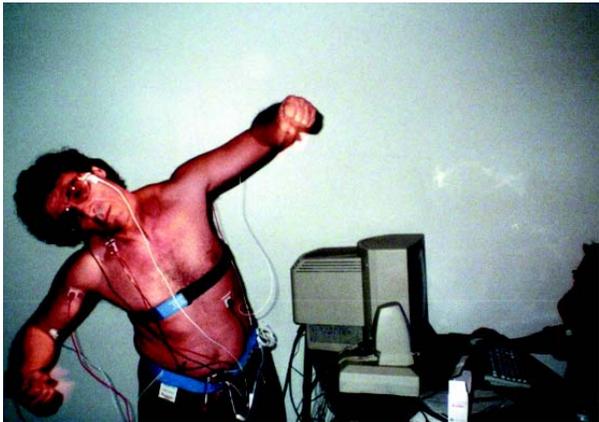
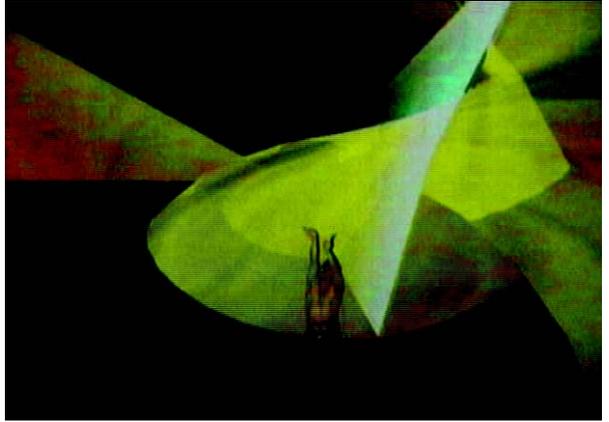
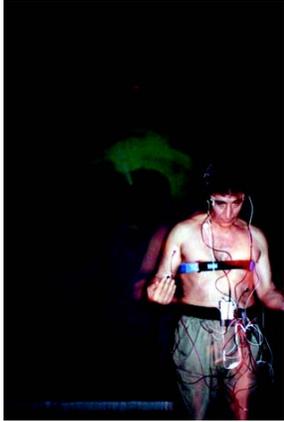
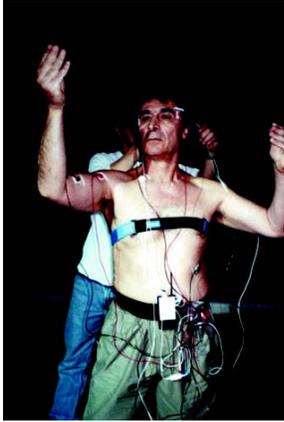
Wentwick, C. (1971). *The Human Figure in Art from Prehistoric Times to the Present Day*. Wynnewood: Livington Publishing

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Julio Bermudez, Jim Agutter, Brent Lilly, Noah Syroid, Dwayne Westenskow, Stefano Foresti : University of Utah, Salt Lake City (different departments and colleges)

Debra Gondeck-Becker: Pine Technical College, Minneapolis Yacov

Sharir: University of Texas, Austin



Of course, this was a simple example; but it was enough to underline how these new architectural CAD systems allow designers to take design valuations and, consequently, to make

**An experience in architectural CAD systems**

*Continued from page 6...*

changes during the entire process. When an element is done with 3D solid modelling tools, simply changes can be difficult to perform by altering the characteristics of its components. Often, it is easier to cancel and to do it ex novo. But now architects can concentrate on the design process, because these systems try speaking a language nearer to architects' world than to computer world.

Today, in the Faculty of Architecture of Genoa is still more widespread the teaching of drafting systems based on lines. On the other hand, architecture offices use largely these kinds of software. But it is possible to perceive the will to overcome this situation; in fact they show great interest in young architects who are able to work with new architectural CAD systems.

**Images**

1 House in Leymen: Herzog and de Meuron (see page 6)

2 Parametric "column"

3 Parametric "column" transformed into Stirling's WZB.

4 Parametric stair

5 Stair of Gebry's Loyola University Law School.

6 Palazzo DeMarini: columns and balusters are parametric objects

7 Palazzo DeMarini: columns and balusters as 3D solid object

8 Parametric object "roof": Wright's Robie House

