Architectures of Enchantment:
Sketching Embodied Experiences in the Built Environment with Temporal Textures

Architectures de l'enchantement:
Les esquisses d'expériences dans l'environnement bâtit par les textures temporelles

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OVERVIEW

Le projet Architectures de l'Enchantement propose de créer des alliages entre des médias physiques et informatiques actifs qui, dans un environnement construit, répondent aux activités humaines et environnementales. Avec ces alliages, nous créons des techniques pour rapidement "esquisser" des environnements physiques qui possèdent un fort potentiel pour le dérapage, la surprise, la transmutation, ou l'interruption dans l'expérience sentie.

The Architectures of Enchantment Project proposes to create techniques and alloys of responsive physical and computational media for embodied sketching in a built environment with strong **potential for *slippage, surprise, or transmutation in felt experience***.

We create these architectural experiment apparatuses not to present acoustic or optical *images*, but to realize conditions of palpable, *first-person experience* augmented by computationally synthesized fields of lighting, sound and active materials. We call these new alloys of responsive, dynamically varying physical and computational media: **temporal textures**, and focus on those that respond to contingent activity, history, as well as compositional design.

We propose to effectively disassemble architectural elements such as lighting, acoustical field, spatial partitioning, building membranes, etc. and re-assemble them with computational media in order to create flexible apparatuses for sketching live, body-scale installations that can sustain events with extra-ordinary affective charge. These apparatuses can be the scale of table-tops, or rooms, buildings, streets, or theater. By apparatus, we mean the complex of physical instruments, craft, procedural protocol, and very importantly, the epistemic and experiential position of the experimentalist.

We proceed in three modes: (1) exploratory field studies, examining how temporal textures of lighting, sound, or woven/non-woven materials and so forth charge events in particular social settings, (2) studio-lab work building techniques and hybrid computational media/materials, (3) interventions in the built environment.

CHOICE OF COMPONENT (21 lines)

The participants, principally the doctoral researchers, are asking questions about the experience of events in responsive, time-based media, questions that have emerged out of their individual and collaborative installations & events, such as Artifact / Les Jardins de Métis Festival 2007 (Harrop, et al.), Remedios Terrarium (Topological Media Lab (TML) + Dedale studio), and eSea Shanghai (Harrop, Sha, et al.). Though informed by these and related concrete art works, considered as field experiments, we pursue experiential and environmental topics that are more open-ended and philosophically challenging than technical questions particular to a singular art work: **the experience and invention of material and temporal textures that can be used by inhabitants to enliven, charge, or interrupt an event in a physical environment**.

Rather than use off-the-shelf techniques and technologies, we propose to do principled fieldwork, open up black-boxed technologies as necessary, and reconfigure them into the experimental apparatus we need. Concurrently we will refine the theoretical questions that we describe below. Each of these processes will take at least two years to refine and explore, and another year to re-deploy in field experiments and in our communities of practice: media arts, experimental architecture and experimental performing arts. Harrop and Smoak are pursuing doctoral studies with Sha that will inform and be informed by this project. We expect their studies to run two to three years from the start of this project.

√ SUMMARY PRESENTATION OF THE PROJECT **Présentation sommaire du projet (86 lines)**

Component A: Explain the objectives of your project and what makes it a project with an exploratory aim (two pages maximum).

Our exploratory research proposal is impelled by the following question:

How can we modulate the temporal textures in a physical built environment such that the inhabitants can, in concert with the ambient environment, create events that have extra-ordinary affect? By temporal texture we mean a time-varying pattern in physical or computational material, at all scales from milliseconds to months. Our practical goal is to discover or create **alloys** of physical and computational media that respond to their environment according to the inhabitants' artistic gesture.

We pose this question for built environments: ordinary places of everyday life, as well as specially marked places like a performance space or a lab. But the key challenge is **to create techniques for modulating physical / computational media that can be deployed in various built environments to shape the potential for *slippage, surprise, transmutation, cracks in experience***.

This is a paradoxical goal because the manufacturing processes, and technology research are systematic, whereas we are looking for ways to sustain what may be mistaken for superfluous, transcendental, random, or irrational, because the affects to which our techniques point lie outside the theoretical and technical systems that we employ.

Material experimentation is a necessary step toward knowledge. Therefore, we assemble alloys of active physical and computational materials in apparatuses for architectural sketching, where architectural implies the embodied, the physical and durational, and sketching implies lightly revisable tracing with just enough detail to get a precise sense of an environment. A built environment includes all the media in a given space, video and sound but also physical material surfaces, hangings, furniture, walls, the membrane of the building, and the material infrastructure. A technical goal is to build on our experience-based design of architectural buildings and theatrical sets together with sensitive analysis of sensor feature patterns and the fine-resolution synthesis of time-based media to explore addressable and actuatable (physically, kinetically modulated) matter. In fact the technical part of our research draws on **materials research**: studying materials such as electrochromic glass or dichroic film, as well as the infrastructural media of building systems: air , electricity, water, lighting.

Our second goal is to generate **techniques** for shaping these alloys in response to a combination of the composer's prior intent, the continuously varying state of activities in a place. We emphasize that these are all superposed, and that the state and inhabitant activity vary <u>continuously</u>, at diverse scales of time and energy. For example, Sha's TGarden responsive space (realized for the Dutch Electronic Arts Festival and for Ars Electronics in 2001) responded to sensor data at millisecond scales, while the prototype state engine responded to collective activity at the minute scale of a theatrical beat, 5 orders of magnitude slower, using a different logic based on continuous dynamical systems. The eSea installation exhibited by Harrop, Sha & colleagues in Shanghai's eArts Festival 2008, multiplexed solar and pedestrian patterns in an even greater range of time. The TML's media choreography framework will accommodate the invention of fresh logics for creating and mixing temporal rhythms.

Sketching the architectural conditions for a range of potential events is not making specific sonic or optical image, or a specific sequence of cued effects (a temporal "image"), but on phenomenological and environmental effects. We explore these effects systematically and repeatably, hence the necessity for building our own computationally controlled apparatuses, which is strength of the TML.

YEAR 1

Based in CAST (Centre for Architectural Structures and Technology), Prof. Harrop will build a database of building infrastructures that can be enrolled in a dynamically active system. The second half of this studio will design interventions with the TML, adapting techniques for sensing, pattern tracking, texture synthesis and animation of time-based media. (2) Smoak will conduct complementary lab & "live" studies of architectural phenomenology, event design, experimental lighting. Sha will develop sensor feature extraction,

real-time media evolution and synthesis techniques with the TML team. We plan exchanges of graduate students between CAST and TML.

SEPTEMBER 2011: Joint TML+CAST 2 week charette for the design and build of proof of concept and prototype event structures involving hybrid materials, bringing together industry researcher collaborators, professional artists, technicians, and graduate students.

YEAR 2

Prototype sensing and ornamental techniques deployed in "live" events at scale in the Hexagram Blackbox or field sites. Conduct exploratory fieldwork and lead workshops at collaborator sites. (2) Blend techniques from the lighting lab, the materials lab, and the media choreography research, for conditioning events at architectural scale. (3) Conduct year-long seminar on architecture and event to provide a continuous, structured reflection on the experimental work. April 2012 Material, sensate and phenomenological event "charette" (two weeks) between graduate students from the U of M. & Concordia University. Location: Black Box, Hexagram Concordia University. With public forum and workshop in Montreal (SAT or CCA)

SUMMER 2012. We finalize documentation, and proposals for subsequent research creation and/or creative projects in the public domain.

This project is primarily exploratory in nature, aimed to generate not toolkits (although we will create tools in the course of our work), but artistic and technical knowledge as new media **alloys** and **techniques**.

√ WHAT THE PROJECT WILL CONTRIBUTE **Démonstration de l'apport du projet (129 lines)**

Explain how your proposal contributes to the program's specific objectives and to the selected component. Then, explain a) how your project will contribute to the development of content and/or digital technology in media creations and b) how the project will generate potential artistic and technological benefits in connection with the artistic interest of the project and the relevance and possible transfer to the world of arts, artists, the industry or the community (three pages maximum).

Philosopher of technology Gilbert Simondon described how initially separate functions of heat dissipation and pressure containment in a steam engine combined into a single set of metal fins that simultaneously hold the chamber intact and radiate away heat. This concrete synthesis evolved in concert with advances in metallurgy. Analogously, we expect to refine our architectural sketching apparatuses in concert with our knowledge of active materials.

Based on the TML's work since 2001 building responsive environments and realtime media, we fuse elements of our realtime sensor and media techniques with architectural research to create **new alloys as temporal textures**: hybrid physical/computational responsive materials, and **new techniques** for sketching ranges of events in a built environment using these new alloys.

Our investigation builds on theoretical work with gesture, responsive environments and phenomenology (Sha 2002, 2004, 2005, 2007), as well as three years of research seminars with faculty and graduate students on alternative architecture or urbanisms, and performance as a mode of knowledge.

A) **HOW THIS CONTRIBUTES TO DEVELOPMENT OF CONTENT OR DIGITAL MEDIA TECHNOLOGY**

A1) **NEW MATERIAL ALLOYS WITH TEMPORAL TEXTURES:** We will integrate our techniques for sensing movement and environmental conditions with temporal textures in industrial materials like electrochromic glass, dichroic film, organic solid state lighting, as well as the materials of smart building systems such as lighting and HVAC. These temporal textures are not fixed "images" but fields that evolve with inhabitant or site activity. Of course there is an intimate relation between the qualities of the new alloys that we create with the types of events we can create as artists with these substrate materials. For example, Torelli's trumpet concertos' slow staccato chords were composed to work with the 12 second long reverberation times of the San Petronio cathedral in Bologna for which they were written. We use the computer not to create specific pieces of music, but to modify the acoustic, i.e. *temporal potential* of a given physically inhabited space. *We create knowledge about how to do this with physical materials as well*. We leverage 5 years of work with physics-based video as a substance sensitive to gesture and movement. Specifically, P. Harrop (2005), will contribute an approach to ornamentation as a *material process*, giving computational, expressive control of physical materials that permits inhomogeneity and nuance. H. Smoak will contribute an approach to digital media as temporal texture. Temporal textures work across physical scale and via intensity qualities like color, temperature, pressure, rhythm, rather than displacement or spatial extent.

A2) NEW APPARATUS: We create apparatuses for sketching not specific events (as show-control system would do), but potential **shapes** of events. These apparatuses aim to bridge new media and architecture, joined by a common link: the *performative event*. It is essential that we retain the appeal of **rapidly sketching**,with an experimental gesture, in materials.

Concretely, our apparatuses will at the outset be formed from the technologies that the TML has developed and acquired over the past three years: sensor / camera / microphone signal analysis software, realtime video software, realtime sound software, wireless sensor platforms, camera + projector & sound arrays, DMX lighting control systems, a textile-based weaving with capacitance sensing of proximity and movement (see TML's WYSIWYG "tapestry"), etc.

Over the next three years, we plan to expand our apparatus as necessary with the support of associate research labs, including those of Jeremy Cooperstock, Center for Intelligent Machines, McGill University

(shared reality environments; video, sound and haptic computation), and Professor Sebastien Roy, Université de Montréal (computer vision, 3D graphics).

A3) NEW TECHNIQUES FOR PRODUCING TEMPORAL TEXTURES: We will also develop physical and computational techniques for modulating these active temporal materials, extending from our prior applications of, for example, adapting physical models to support sketching actuated materials in live, built environments.

We harvest technical results from the Ozone media choreography project to develop rich techniques for composing not just a specific event or effect but a space that continuously varies in response to the composer's intent, the inhabitants' contingent activity, and the history of the system.

B) POTENTIAL ARTISTIC OR TECHNOLOGICAL BENEFITS

B1) BENEFITS TO ARTS AND ARTISTS: Digital action inhabits a range marked by CPU milliseconds and gestural seconds, a vast range, yet one that is hardly adequate in an architectural context. Architecturally scaled activity can inhabit rhythms spanning a day and a year, from the sun's path across the day to the more nuanced seasonal projections through precise apertures in the building's skin.

Consider some well-known historical examples such as the perpetual transformation by stained glass in Sainte Chapelle Paris (Gothic 13c). Abbot Suger wrote that such light (particularly light in motion) embodies a divine other world. Or consider the precise "light cannons" of Le Corbusier's La Tourette and Ronchamp's dynamic light walls. In those early 20c modernist works, directed light illuminates, circumscribes and accentuates specific zones of a building during differing times of the day and season. Like a spatial clock, light structures the manner in which the building is inhabited through polyrhythms ranging from the hourly to the seasonal. Olafur Elliason's sun simulacrum in "The Weather Project" in the Tate Modern (2007) worked as a static and entirely manufactured light-field that transmuted the program of a public space to permit a wealth of improvised, extra-ordinary action.

We approach the challenge of creating temporal textures across active materials, thinking of *ornament as process*. In modern times, Adolf Loos demoted ornament to the superfluous, the irrational, degenerate mannerism. But the gargoyle directed the flow of rain from the rooftop as an essential part of the building's water circuitry. We see ornament as being an intrinsic part of the material apparatus of a building. Indeed as the expressions of the grotesque figures from Michangelo's Palazzo dei Conservatori, in Rome, dramatically transform throughout the course of the day, we see that artfully shaped stone responds to change in its ambient environment.

We see ornament as the ceaseless unfurling of material form over gestural or historical time under the impact of human intent and environmental material dynamics.

B2) BENEFITS TO INDUSTRY AND ARCHITECTURE: We are establishing the critical ground for this work with the concurrent publication of a special issue in AI and Society edited by Sha, on poetic and speculative architecture. This issue presents a diverse array of alternative ways to inhabit or to realize built environments in both more rigorous and speculative ways. In collaboration with institutions such as the Canadian Centre for Architecture, we anticipate disseminating portable results of our investigation to relevant communities in architecture, media arts, and digital media.

B3) BENEFITS TO COMMUNITY: Architecture is the physical apparatus that conditions events in a built environment. Therefore questions about shaping the potential for poetic activity in built environment, especially ordinary environments, necessarily involve architecture as art.

Eighty years ago Max Weber famously argued that modernity, by separating the religious from the rational, removed magic and myth from our world. He called this the ***disenchantment*** of modern society. But perhaps modernity is not so monolithically successful as Weber claimed: what is thrown out by day returns with the night. Instead of splitting life into rational and irrational, or retreating to transcendentalism and fundamentalism, can we open material, ordinary, physical situations so *extra-ordinary, non-teleological* poetic activity can emerge?

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√ ROLE OF THE PRINCIPAL APPLICANT AND CO-RESEARCHERS (86 lines)

Describe the role of the principal applicant and co-researchers and their involvement in the project (two pages maximum).

Professor Sha Xin Wei: As director of the TML Dr. Sha will be responsible for overseeing the core research on (1) conceptual and critical aspects of this project, and (2) computational methods, including sensor data pattern analysis, physically-based media synthesis, and media choreography.

Dr. Sha will supervise several prepared teams of research assistants, including: (1) a core media choreography team to extend and build applications on the Ozone realtime sensing and responsive media re-synthesis system; (2) an active materials team with mechatronics experience to build on the WYSIWYG active textiles project (conductive fiber woven textile controllers with Prof. Marcelo Wanderley, Input Devices and Music Interaction Laboratory, McGill University, and Prof. Joey Berzowska's XS Lab for active textiles).

Dr. Sha will also oversee a series of faculty - doctoral seminars running throughout the duration of the project. These seminars, continuing from 2005, will provide a place for refining questions and approaches the draw from, and feed into the material experiments.

As the research advances, Sha will design and lead techno-scientific projects to explore the technical questions that emerge from this exploratory project, in areas such as gesture and movement pattern analysis, feature extraction, shared presence, realtime media synthesis and control, and abstractions for activating hybrid computational / physical materials. Sha will lead research on phenomenological aspects of intentionality or collective activity, calling on parallel projects with Prof. David Morris (Philosophy, Concordia), and Dr. Satinder Gill (Music and Science Laboratory, Cambridge University).

Sha will supervise a series of public symposia bringing speakers from peer research centers, artist and design communities, community development, and industry to motivate and explore questions of material and architectural phenomenology in the built environment. Sha will supervise the presentation and diffusion of results in exchanges at three levels: (1) expert practitioners (in lab), (2) informal prototypes (for example with La Société des arts technologiques / Society for Arts and Technologies where Sha has presented work since 2005), and (3) peer artists, designers and architects (for example, with the Canadian Centre for Architecture where the TML was invited in 2009 to deploy two prototype realtime video and lighting installations).

Professor Patrick Harrop will contribute his expertise in composite materials, digital fabrication technology art and architectural history and as a professional licensed architect.

Harrop will also supervise University of Manitoba graduate students in Architecture who have been working with PhD student Harry Smoak and other members of Dr. Sha's TML over the past two years in preparatory studios. This history includes a track record of collaborative event based design charettes on inflatables and toy mechatronics (Harrop(U of M), Krueger(RPI), and Sha (Concordia)(2007), and a studio on complex and autopoietic systems (Harrop (U of M), Sha (Concordia)(2008).

Harrop will also mediate between the professional and artistic communities in the tangent practices of architecture, urbanism, and digital media arts.

• Work with two teams of graduate students: Students from the Concordia Computation Arts program at Concordia University as well as graduate students from the architecture department at the University of Manitoba in an ongoing series of workshops and studios culminating each year in joint-atelier charettes to design and build proof of concept and prototype event structures involving hybrid materials, bringing together industry researcher collaborators, professional artists, technicians, and graduate students.

Phase 1: Analysis of potential building systems for responsive data transmission.
September to December 2010
Findings and database will be developed at U Manitoba's CAST Centre for Architectural Structures and Technology (where Harrop is faculty researcher), and also make use of the Hexagram facility at Concordia University.

Phase 2: Testing active materials and sensing technologies in architectural settings
January to September of 2011
Conduct a workshop and charette with the U Manitoba graduate students using sensing techniques developed at TML to test physical sensing devices designed for buildings and spatially extended material.

Phase 3: Develop prototypical sensing and ornamentation techniques
September of 2011 April of 2012
Refine sensing techniques and actuation of hybrid materials in integrated, large-scale structures. Harrop will lead a series of "charette" based workshops between the TML and CAST, with the aim to use in an integrated way TML's computational systems for sensing and controlling media, with the hybrid physical / computational materials.

√ ROLE AND INVOLVEMENT OF STUDENTS (21 line)

Describe the role that the students play and their involvement in the project (half page maximum)

Doctoral students Harrop & Smoak will review the state of the art; design and oversee experiments and field research; hybridize performative systems with architecture, informed by ethnographic technique.

Media Team. TML HQP specially trained in the Ozone media choreography system will support the rapid prototyping of diverse performative and architectural experiments designed by the researchers.

Materials Team. Supervised by Harrop and Smoak, students will research active materials, acquire samples, test in benchtop or maquette projects.

Field Research Teams. Harrop and Smoak will lead assistants in conducting field studies and experimental interventions in Montreal. Harrop can supervise architectural field studies in each phase.

DISSEMINATION AND TRANSFER PLAN **Plan de diffusion et de transfert** (43 lines)

Present the dissemination and transfer activities for your project (optional for component A- Projects with an exploratory aim) (one page maximum).

Although this project has an exploratory aim, it comes prepared with several years of theoretical seminars and practical workshops. And it looks forward to dissemination.

Publications

Dr. Sha is editing a special issue on "Soft Architecture" including essays by Smoak and Harrop. It will be published by AI and Society in the coming year. This special issue should make a definitive impact on the discourses surrounding interactivity and architecture, major vs. vernacular or subversive modes of architecture; and architecture as a poetic or speculative practice. We plan to publish aspects of the work in relevant journals (e.g. Grey Room), and as parts of Smoak's and Harrop's dissertations.

Seminars

We plan to run a year-long seminar on experimental and poetic architecture open, as has been traditional in the TML, to peer artists, professionals, and scholars. Building in the TML's past practice of formal and informal residencies, we plan to invite a series of practicing architects and architectural researchers to participate in the seminar.

Exhibiting Experimental Work

The TML has been invited by UC Irvine to present media choreography work at the Beale Art Center in Fall 2009, and at Duke University's Nasher Museum, pending funding.

We anticipate collaborating with architecture research organizations, notably the Canadian Centre for Architecture. The best way to disseminate complex practices is to perform it shoulder to shoulder with practitioners. In the first two years, we anticipate collaborating with amenable architectural design, urbanist, or public space groups like Champ Libre, Dare-Dare, Adaptive Actions, or FoAM (Brussels), to build field installation-experiments.

√ BUDGET JUSTIFICATION **Prévisions budgétaires (suite)** (43 lines, CUT 22 LINES)

Justify each expense as it relates to your project. This justification is part of the evaluation process (one page maximum).

GRADUATE STUDENT FUNDING: $25K in Years 1 and 2 is allocated for doctoral student H. Smoak, who will act as the main experimentalist, bringing together expertise in technical theatre, lighting, human computer interaction, ethnography, responsive environments.

$5K in Years 1 and 2 is allocated to sponsor Concordia graduate students research assistants supervised by doctoral investigators Harrop and Smoak. The assistants will help carry out (1) materials research, (2) material experiments, (3) field surveys, (4) documentation editing, under the supervision of the principal investigators and the doctoral researchers. Estimate: 200 hours/graduate assistant-year.

PROFESSIONAL FEES: In order to develop prototypes to a standard deployable in the field, we budget $3000 in Year 1 to engage professional consultants with complementary expertise essential to the research, including computer programming, materials science, and electrical engineering. We budget $3000 bring them back in Year 2. We budget $1000 for each consultation-workshop, 2 (= $2000) in Year 1, and 3 (= $3000) in Year 2.

*CONSULTANTS: In Year 1, we will need programming from the expert, post-graduate research assistants on the Ozone real-time media team (for example, sensor analysis, state engine, real-time video, real-time sound, actuation): $28.57/ hour @ 70 hours = $2000. As the experiments grow more fleshed out in Year 2, we plan more programming support: $28.57/hour * 105 hours = $3000.*

TRAVEL ACCOMMODATIONS: To facilitate PI air travel between the CRC research facilities located at Concordia University and U of M, and for dissemination we budget 3 trips: 2 x $1500 (N. America), and 1 x $2000 (international) = $5000 in Y1 & Y2.

MATÉRIAL ET FOURNITURES ET FOURNITURES DE RECHERCHE: Costs for obtaining experimental materials is significant. However, we will seek significant in-kind contributions from existing manufacturers. In Year 1, $6000 will seed the acquisition active materials sample kits from current manufacturers. In Year 2, we have budgeted an additional $4000 to acquire additional samples as our knowledge of the active materials field is fleshed out, and new kits become available.

FOURNITURES INFORMATIQUES ET ACHAT DE BANQUES DE DONNÉES
We budget $4000 in Year 1 and $5000 in Year 2 for acquisition costs of plastic and metal materials for manufacturing prototypes; materials used in plastics tooling and prototyping such as ABS, Somos Resin, or mold making and casting; common electronic components and conductive materials.

[1] Examples include *gestural sound* and *calligraphic video* (See http://topologicalmedialab.net Research.)

[2] See, for example, Karen Barad, Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning, Durham: Duke University Press, 2007, 142-145.

[3] Media Choreography, http://www.topologicalmedialab.net/joomla/main/content/blogcategory/5/21/lang,en/

[4] TGarden, http://topologicalmedialab.net/xinwei/sponge.org/projects/m3_tg_intro.html

[5] A temporal texture is a temporal pattern as a function of greater than one independent dimension, realized in a physical substrate.

[6] See for example, references to the Topological Media Lab's documented work in calligraphic video, gestural sound, Ubicomp 2003, ICMC 2007, SMC 2007. [7] Gilbert Simondon, Du mode d'existence des objets techniques. Paris: Aubier, 2001 (1958); English translation by Ninian Mellamphy of Part 1, University of Western Ontario, 1980, p. 15.

[8] Giuseppe Torelli, Complete Works for 1, 2 & 4 Trumpets, 1994. [9] Extending from computer graphics where structured light means simply projected target patterns allowing auto-focussing. [10] Doug Van Nort et al. 2007; David Birnbaum et al. 2007. [11] IBM Cell Broadband Engine, http://www.ibm.com/developerworks/power/cell/community.html?S_TACT=105AGX16&S_CMP=LP [12] TML Ozone media choreography system, http://topologicalmedialab.net -> Research pages. [13] Max Weber, The Protestant Ethic and the "Spirit" of Capitalism and Other Writings, Penguin Twentieth-Century Classics, New York: Penguin Books, 2002. [14] Professor Ron Broglio, School of Literature, Communication, and Culture, Georgia Institute of Technology, Atlanta, USA.