

Sponge: A Case Study in Practice-based Collaborative Art Research

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ABSTRACT

In this paper, we describe the origins, thematics, projects and practices of the art research collective Sponge. In particular, we focus on Sponge as a useful case study in transdisciplinary, collaborative practice-based research in creative art and design production and specifically, on Sponge as a unique example of a community of practice that spans artistic production, techno-scientific research, and critical studies. Issues essential to collaborative work practices such as shared language, construction of boundary objects, accommodation of differing epistemic cultures as well as Sponge's thematic interest in performance, materiality and agency are examined in the context of several large scale artistic projects produced in the US, Canada and Europe. Finally, we examine the relationship between Sponge and the second author's Topological Media Lab in trying to come to terms with the differing scales and life cycles in partnering between the university-based research lab and the sphere of artistic and cultural production.

Author Keywords

transdisciplinary, communities of practice, art research, communities of interest, boundary objects, performance, materiality, gesture, responsive environments, shared language, consensual domains, embodied interaction, resistance, agency, interaction.

ACM Classification Keywords

J.5. Computer Applications: Arts and Humanities

INTRODUCTION

Founded in San Francisco, California in 1997 by Laura Farabough, Christopher Salter and Sha Xin Wei, the collaborative art research collective Sponge has described

itself as an "entity realizing hybrid media spaces and performances utilizing investigative art, speculative design, techno-scientific research and critical public discourse" [13]. Yet, another description in a 1998 brochure devised by the group stated the following: "Sponge creates problems and inquiries regarding the nature of experience in the technologically augmented world [...] its ongoing conversation fuses its members interest and expertise in computer science, mathematics, experimental performance, visual art, computer generated sound and electronic music and philosophy" [Sponge internal publication, 1999]. Sponge further described its work succinctly in a 2002 interview for the French publication *EcArts*: "[...] thus, we are interested in setting up compelling conditions which enable people to make their own meanings out of built spaces and environments (spaces being architectural, symbolic and media)" [14]. One review aptly described the group as a "decentralized association of ideas and tactics with countless points of entry and use" while other critics and participants in its work exhibited in more than seven countries and in international media art venues such as Ars Electronica, V2 Rotterdam and SIGGRAPH, among others, have described it as "hermetic," "groundbreaking," "utopian," "highly cerebral and potentially, wholly practical" [6].

What makes Sponge unique enough to warrant these pages goes beyond the group as a fruitful case study of collaborative, practice-based research in creative art and design utilizing media and computational technologies. Rather, we wish to examine Sponge as an salient example of a specific kind of *community of practice*, what the social anthropologist Jean Lave and the learning theorist Etienne Wenger have described as social groupings involving the sustained pursuit of a common enterprise and a shared repertoire of communal resources developed by its members over time [4].

Part of Sponge's *practice* or its manner of doing and approaching things shared by its central members over the past seven years has been an effort to expand as well as question the boundaries of artistic production with technology. It has done this by not only exploring dissemination avenues normally not associated with artistic

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contexts such as peer reviewed publication and academic conference settings in areas ranging from computer science, computer music and social studies of science and technology but also by using artifacts associated with the sphere of cultural production (public exhibition and performance) as study objects to rigorously examine the permeable boundaries between aesthetic practice, techno-scientific research and philosophical inquiry. What is the more interesting to examine here is how Sponge, as both a collective entity under a single signature as well as through the personalities of its individual members, has utilized the space of artistic expression as a vehicle for the production and transfer of knowledge from its internal community of practice into the larger public realm.

The other aspect of Sponge's work that this study focuses on are the theoretical and practical issues the group has explored and encountered in its attempt at maintaining a collaborative, transdisciplinary practice. Here, we use transdisciplinary in Michael Gibbons' sense as "research involving a stronger "interpenetration of disciplinary epistemologies." Effectively, this means new fused horizons become possible, beyond or transcending paradigms existing within single disciplines" [2]. Due in part to the multi-disciplinary backgrounds (mathematics, computer science, theater, computer music and philosophy), of its three core founders-members, Sponge from its start has recognized the difficulties inherent in such collective enterprises that initiate play and blurring between different "epistemic cultures" [3] while simultaneously making such an enterprise an integral part of its practice. It is in this respect that this study of Sponge bears import for the domain of practice based research and continued work in areas such as the social study of science and technology, knowledge formation and production and the burgeoning field of *art research*: the creation of knowledge from different fields that results in the production of artistic artifacts, events and practices.

The paper is divided into two parts. Part I examines the Sponge's origins out of an interdisciplinary Stanford University humanities seminar (IMG), focusing on the collaborative mechanisms deployed by the group. We then attempt to elucidate several principal Sponge themes in the areas of performance that serve as *modus operandi* for its practice. Part II is a case study of several Sponge projects starting in 1997 and leading up to present, particularly focusing on work undertaken in the international *TGarden* project between 1999-2002.

ORIGINS

Sponge originated out of a Stanford University Humanities Center co-curricular seminar entitled "Interactive Media: Theory and Technologies of Representation" (code name IMG: The Interaction and Media Group) co-organized by Sha Xin Wei, a Harvard and Stanford trained mathematician and, at the time, human-computer systems architect at the university. The aim of the seminar was to seek ways of articulating, conceptualizing and working with digital media

or more generally, computer-mediated interaction. While the group was constituted from individuals in comparative literature and modern thought, computer music, theater, psychology and other branches of the humanities, there were also participants from the natural sciences as well as lurkers from the nearby think tanks and techno-scientific research labs of Silicon Valley (Xerox PARC, Interval Research, Apple Computer). From its outset, IMG's strategy was to examine interaction and media paradigms from a number of complementary and contrasting disciplinary perspectives across the humanities, arts and sciences and through this, expose its participants to a multiplicity of languages, techniques and approaches. "What seems interesting to us is the way certain fields are yielding unexpected and fruitful clues for practical developments in technology. So, for example, theater may provide models for user-interface design, topology and geometry for media structures and urban architecture for "cyberspace" design" [IMG internal notes, October 1995]. IMG's polyglot of disciplines and approaches around a common theme would later prove to be a major influence on the development of Sponge's operational tactics.

Shared versus Common Languages

The goal (if one could call it that) of IMG was two fold. First, as previously stated, the group sought ways to articulate and conceptualize working with digital media and computer-mediated interaction. More specifically, IMG was engaged in a "study of issues related to interactive media, hoping to find a way toward a constructive theory of how people compose and *inhabit* interactive media" [IMG internal notes, October 1996]. A second and more ambitious goal, however, lay in the attempt to bring individuals from divergent disciplines together in the hopes of articulating not just a specialist language for media and interaction but a *shared*, publicly developed one. The aim of creating such a shared language contrasts markedly with the notion of a common language: the presumption that individuals from radically different epistemic cultures can eventually agree on the same connotations, contexts and meanings of words. While the goal of a shared language was not to be underestimated, the ambition to create a space of discourse based on shared concepts and constructs rather than a collage or dictionary of mutually-alien expertises that had little common epistemological ground (i.e., theater and mathematics, computer science and literature, organizational behavior and art practice) lay at the core of IMG's mode of operation.

In the manner described here, the IMG sessions exemplified how different epistemic cultures create meaning by mixing and annealing language. In vigorous and heated discussion, words would be interrogated and dissected by the group or subject to explanation based on the particular disciplinary context they would be deployed in. In this way, this struggling with language bears similarity to what Humberto Maturana has described as "consensual domains" – the community of common practices and mutual interactions that is catalyzed and generated by the language of its participants.

Within IMG's community of practice, language was used not only as a transmitter of information or as a system of description, as Winograd and Flores have labeled it, but also as a means of creating a cooperative domain of interpretations. "A language exists among a community of individuals and is continually regenerated through their linguistic activity and the structural coupling between generated by that activity" [20].

Materialized conversation

Sponge emerged as a collective out of both the general IMG discussions as well as a spin off dialogue initiated by Sha, Laura Farabough and Chris Salter, three of IMG's core members. If IMG's stated interest was not only a theoretical exploration of the interplay between interaction and media but also how to compose and inhabit such media, why not then utilize techniques from artistic practice to bring the conversation to a broader public by way of real time experiments? What bears mentioning here is that Sponge derived from the need to create a site of continued discourse for a group of individuals who felt they were pressing up against the epistemological limits of their own disciplines (performance, mathematics, computer science, music) and were searching for new techniques and knowledge from other forms of practice. "Sponge is interested in setting up compelling conditions which enable people to make their own meanings out of built spaces and environments (spaces being architectural, symbolic and media) and for this reason we are looking outside of the domain of art – to fields such as human-computer interaction, ethnography and information design. These sorts of enterprises use methods very different from the convention of narrative to construct a compelling or meaningful experience" [15]. This inadequacy of singular disciplinary approaches to pose broader investigatory questions also marks a second characteristic of the trend towards transdisciplinary research and knowledge production that we spoke of earlier.

Of course, artistic production has a firmly established historical tradition of such disciplinary fusions from Brunelleschi to the Oulippo. Yet, what we feel distinguishes Sponge's mode of practice from other "interdisciplinary" and "cross disciplinary" projects is the desire to take the interplay between the epistemic cultures of techno-science and artistic production seriously and to use such cultural production contexts as *gedankenexperimenten*; a forum for the posing of specific thought experiments and the production of concepts.

What is even more relevant is the role that Sponge serves as a factory creating "boundary objects," Susan Leigh Star and James Griesemer's term for objects that inhabit a space of negotiation and serve to support cooperation between the participants without agreeing on the classification of such objects or their actions [17]. Such boundary objects arise over time from "durable cooperation among communities of practice. They are working arrangements that resolve anomalies of naturalization without imposing a naturalization of categories from one community or from an outside source

of standardization" [18]. Sponge's boundary objects are actually more boundary *events*, with definite temporal and social extent, in which people from different communities of discourse and practice, local citizens, media festival-goers, school-children, visual artists, performance artists, designers, musicians, philosophers, programmers jointly create and reshape responsive media in a common location using their respective manipulatory techniques.

PERFORMANCE

Another theme that distinguishes Sponge from many digital media practices concerned with object creation, data representation and virtuality is its emphasis on performance and materiality. This approach is partly rooted in the collective professional and personal histories of the group's members. Yet, it also is based in the desire to utilize performance heuristics and intentions to enlarge the scope of questions normally associated strictly with technology as well as to apply performance experience towards the design of richer human-computer interaction environments.

It should be made clear here that Sponge's use of the word performance is interpolated from several different contexts culled from performance theory, architecture, mathematics and philosophy and does not completely subscribe to traditional connotations, either in artistic production or as a term denoting the efficiency and optimization characteristics of technical systems, most often utilized in HCI and human factors contexts.

Sponge's notion of performance is first distinguished by micro and macro scales. At the micro level, performance signifies the unintentional or intentional ordinary gesture: drawing, writing, shaping objects, throwing something away or walking. What is important to note is that such gestures, although enacted either consciously or unconsciously by individuals may not be noticed as being performative—that is, as deliberately enunciating some meaning or action. In fact, such gestures may not be deliberate or signify anything at all at the level of communication. This is a micro level of performance, which Sponge describes as "performing with a lower case 'p.'" where performance is a much more low-key activity: the making of traces, the making of symbols, the shaping of objects which are temporally-embedded processes. "It's always something that you can fall into or step out of but usually you fall into" [16]. This sort of microperformance is quite different from the normally accepted sense of performance at the macro level: the conscious construction of an event between a spectator and an "actor." Here, Sponge specifically invokes performance in its accepted theatrical context in order to point out a crucial distinction between the micro and macro scales. While the micro scale of gesture may not even be noticed, that is, may remain under a certain perceptual threshold and thus not depend on a spectator, the macro scale of the event (performance with a capital "p") assumes a clear cut between looking versus doing or, in theatrical language, acting versus spectating. The consequences of shifting between (or

blending together over time) the micro and macro scale of performance by amplifying and diminishing the thresholds of gestures and actions, however, begins to make the border between performing and observing more permeable. “In our current research, we’re interested in dissolving the stage itself. This means saying goodbye for the time being to the traditional set relations between performer and viewer. We’re not trying to do this in a forced way, as many 1960’s theatrical experiments that “democratized” the stage did by pulling spectators over the proscenium and onto the stage itself. We’re after something much subtler, designing situations and events where unpredicted spatial and social conventions emerge out of locally-situated actions” [16].

MATERIAL AGENCY

Still a third and more nuanced notion of performance doesn’t come from the arena of art at all, but from work in the history of science and technology that sees performance as the real time articulation of material agencies in the world between human and non-human socio-technical apparatuses, systems, processes and agents. In his 1998 study *The Mangle of Practice: Time, Agency and Science*, historian of science Andrew Pickering persuasively describes science as inhabiting what he terms the performative idiom: “an idiom capable of recognizing that the world is continually doing things and that so are we” [7]. The world is “shot through” with agency and “does things that bear upon us not as representational, observational statements of facts and figures on disembodied intellects but as forces on material beings” [8]. Pickering’s move towards performance calls us to think beyond the purely human-centered nature of agency (and performance’s enunciation of that agency) and towards an interconnection between human agency and material agency. Human practices are captured in machines in a continual, real time process of intertwining; what Pickering terms “interactive stabilization.”

If performance then, can be seen as an intertwining of human and material agencies, continually performing and “dancing” together in a “dialectic of resistance and accommodation,” then performance may become a characteristic and quality of numerous material agencies (gestures, bodies, machines, architectures, data). Sponge writes: “Our laboratory, which is partly made of responsive media, is itself not a fixed object—its form is deformed under the action, the impact of these subjects who go through the space. And finally, our subjects may not be subjects at all, human or non-human, but rather diffused flows of agencies—fleshy, fabric, computational or media agencies.” Performance at this fundamentally other level includes shaping and playing in the material substance and substrate of the world itself and enables performance to diffuse and move among many agencies simultaneously. “The world makes us in one and the same process as we make the world” [9].

The account of material agency presented here underscores a strong difference between Sponge’s method of approach and many reigning modes of digital art making aesthetics

fascinated by the informatic and cybernetic representation of data as knowledge. As Pickering’s articulation of human and material agencies constitutes an attempt to move away from seeing science as semiotic practice with representations of facts, Sponge’s deliberate performance turn aims to shift away from pre-defined, a priori objects of representation that are already given in the world (i.e., schemas, models, etc) outside of experience. Instead, the focus falls on an ongoing process where bodies and subjects *emerge* through play and performing within the material field of the world itself. It is here where part of Sponge’s interest in the potential pliability and responsiveness of computational media technologies lies; not in media and data as representation but in its material substance. “We are equally fascinated by the agency of the material, the friction of cloth, the decay of data, the elasticity of MIDI-controlled sound, and by the agency of disciplines – grammar, algebra, systems of orthography, legal systems, and so forth. These are all larger than any one of us, and yet they are born out of our own actions.” [16]

The move to seeing performance as a means of articulating the play and friction among different types of agencies is potentially fruitful for examining the consequences and experiences involved in the interaction of humans and machines. This seems to us particularly useful given the turn in some circles of HCI away from models of representation and towards theories of “situated action” (Suchman), “interactive cognition” (Gedenryd) and “embodied interaction” (Dourish). Ironically, however, much of the influence of performance with a capital “p” that has entered into the HCI dialogue still clings to theories of dramatic representation, through concepts of mimesis, character, identification and catharsis [5].

We believe that the notions of performance described here may provide more potent ways of thinking of the design and subsequent experience between human and machine systems.

PROJECTS

M1 (1997)

After an extended period of conversation among its three founders, Sponge’s first experiment titled *M1*, which took place in the spring of 1996, was ironically an attempt to investigate performance from the ground up, without resort to direct technological mediation per se. The project set out to research the relationship between intentional and unintentional gesture and to investigate the potential emergent social patterns that may evolve in a situation fluctuating between scripted and aleatoric events. Questions that provoked the experiment included the following: Where does the threshold lie where an ordinary gesture become performative? How are ways we can mark a gesture in such a way that it becomes performative to an “ideal spectator” that recognizes such a gesture but doesn’t call it out so that others will notice it?

Over an eight-week period, three times a week at the same time, six trained participants performed a pre-scripted sequence of ordinary gestures and actions for a thirty-five

minute period in a crowded public eating area at Stanford University. Each of the participants was assigned a series of gestures and actions that were “embedded” into the social climate of the eating area—embedded to such a degree that most, if not all of the gestures would go virtually unnoticed to those inhabiting the site. Everyday gestures such as unwrapping a sandwich, throwing something into a trash container, walking out of a store and reading a newspaper, among others, were performed first in a straight sequence and then marked through various techniques to change their “thresholding”: repetition, architecture and geometry of bodies, patterns of movement over defined time sequences and the purposeful ignoring of ambient intentions and environmental feedback.

In viewing the videotaped results of the experiment after the fact, one could see a kind of spontaneous choreography of gestures (as seen from without) emerge and spread among the participants over the duration of the thirty-five minutes. What was perhaps more revealing, however, was the fact that such gestures and patterns appeared to be perpetuated and “picked up,” not only from the pre-scripted performers but also from those who were not “officially” part of the scripted performance. The question of whether or not such mirroring or imitation of gestures was deliberately intended by observers in the scene who had “discovered” or recognized the artificial performance in progress or instead only inferred from Sponge in a post- experiment phase of observation constitutes part of *M1*’s overall inquiry.



Figure 1: M1, Stanford University, 1997.

Gestures and actions in the form of imitation, doubling and further repetitions from “spectators” in the scene were in hindsight perhaps subjected to the question of observer bias (i.e., what kind of patterns is one looking for) or just the result of chance occurrence. Finally, in something that would play a continued role in Sponge’s later, more specifically media-computational investigations, the question of how recognition and propagation of patterns from such gestures contribute to the gradual building up of meaning over time would be fully explored in Sponge’s later work of conceiving and building sensor-activated, responsive spaces.

M2 (1998)

Produced in San Francisco in 1998, Sponge’s next project *M2* was the result of a one-year concept, design and implementation period and moved much further into work with digital systems than *M1*. In what would come to become a standard approach to developing projects, individual members would work outside of the group on independent projects for both financial as well as creative reasons. Whether conscious or not, such work in more complex (and financially lucrative) projects in the then-burgeoning multi-media industry in San Francisco and Silicon Valley had an indirect influence on Sponge’s approach to project development, planning and management.

The issues of emergent patterns that were undertaken and studied in the *M1* experiment directly transferred into the conceptualization of *M2* yet resulted in a decidedly different manifestation. From the start of the process, it was agreed that the site of presentation should be more controlled than the earlier *M1* experiment in a public space. Indeed, the contextual shifting between public-outdoors space and controlled environments would become an important hallmark of Sponge’s subsequent work. This level of control not only is relevant in terms of the logistical complexity of the physical event that Sponge constructed (a six-room walk-through architectural/media environment through which small groups of spectators were cycled over varying time lengths) but also provides the background horizon for the central question that drove the *M2* project. How is it despite the instability of symbolic, linguistic and representational systems that we make and produce that a fundamental *material* stability still exists as the deeper, *sedimented* part of human experience? In other words, despite the instability and anxiety we afford to symbolic systems, there still exists a deep, sedimented stability that is afforded to us by the world of matter. The starting point of *M2* attempted to place this relationship into question.

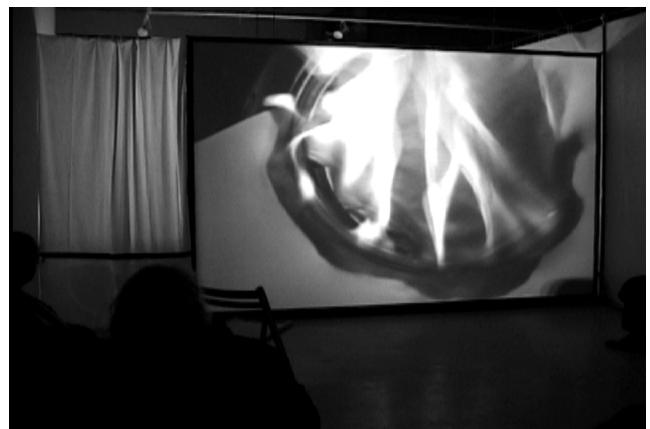


Figure 2: M2, The Lab, San Francisco 1998

In the San Francisco realization of the environment, five individual spaces were architected inside a large, empty gallery. Each of these spaces was assigned a particular thematic significance that related to the individual spaces as

well as to the overall event. As visitors moved from space to space with the help of assistants carrying specific time instructions, the participants encountered themes of “waiting” (the waiting room), “control” (the room where performers controlled and played the audio/visual systems), “immersion” (a space of floating screens and projections and physical heat generated from live stove top heating coils suspended inside mesh cages) and “transformation.” Cycling through the environments, the density of elements, degree of media overload and ways of interpreting the sequence and meaning of individual elements of the experience fluctuated in both emotional affect and perceptual complexity. Disjunctive images and sounds evoking erotic experience, solitude, abandonment and transformation, instability and deformation of media were played and edited live from pre recorded narratives burned onto laser discs and projected onto floating, miniaturized screens in the second environment (the immersion space). Such emotionally charged media reappeared several times throughout the installation in increasingly mutated forms, while perspective shifts were continually re-introduced throughout the sequence of spaces. Through such a process of meaning accretion, the experience for the visitors was akin to a physical and emotional journey through increasingly layered fields of architectural, media and symbolic affect.

While this brief description of the event clearly doesn’t suffice in conveying the overall experience of participants (audience members later described physical sensations of vertigo, stillness, confusion, solitude) what is useful in this context is to briefly examine how Sponge’s collaborative strategies enabled the transformation of conceptual and philosophical constructs into a material, performative event between bodies, heat, media and architecture. What is interesting are the ways in which real time, performative processes of talking, sketching, drawing and writing were utilized by Sponge to render ideas from multiple perspectives into concrete, material form. In initial concept and eventually, design sessions, ideas brought to the table were consistently subjected to a rigorous process of “translation” from one epistemic culture and form to another. This process of translation marks another key characteristic inherent in Lave and Wenger’s understanding of communities of practice. For example, an idea about the instability of matter was translated into several different contexts, ranging from philosophical (interpretative) notion to one rendered in the mathematics of manifolds to one based on the thinking of centers of gravity in the physical performing and dancing body.

A further process involved the constant “performing” of ideas between members, where communal writing and sketching served as material for creating ideas and sharing them amongst the group. Indeed, this process of struggle and accommodation in communal sketching, marking and writing is acutely evidenced by the endless series of notebooks and sketches generated during the *M2* process featuring page after page of diagrams, flow charts, notes and illustrations on things ranging from the time cycles of the environment to

philosophical inquiries on the nature of phenomenal experience and mathematical notation. This theme of writing and performing would later take on further weight, in both the group’s work with its long-term project *M3* as well as with individual members’ research.

What also bears noting here is the disciplinary diversity of audiences who attended the three-week event in May 1998. Veterans from Silicon valley research labs, video and well known theater artists, mathematicians, curators, electronic musicians, philosophy students from Stanford and Berkeley as well as computer scientists and literary scholars all were initial participants in Sponge’s first attempt at bringing a discourse and set of practices that had originated under IMG’s umbrella outside of the confines of the academy and the gallery space and into the broader sphere of its participants.



Figure 3: M2 (Immersion Room), The Lab, SF 1998.

M3 (1999-2003): Perturbing the Informatic: *TGarden*

Sponge’s next project *M3*, developed in late 1999 after an extensive period of evaluation and re-grouping, was to become its most ambitious one, in theoretical and practical terms. It is also in *M3* where the notions of threshold performance, materiality and agency set out in *M1* and *M2* would reach their full fruition in the design of new kinds of sensor-driven responsive media environment. Originally conceived as a set of three large-scale spaces which would take the visitors/players (as the “audience” would from hence be called) through a performative manifestation of Sponge’s multi-valent research exploration, visitors to *M3* would begin with a critique of the informatic world view (Room 1, entitled *Puzzle*) then segue into a space focusing on the perceptual experience of the world undergone in spaces of immersion (Room 2: *Sauna*) and, finally, arrive inside a social play space where media and social activity could be collectively and continuously shaped by the participants in real time (Room 3: *TGarden*).

While conceived as a total event, financial, logistic and creative complexities prohibited the simultaneous realization

of all three parts of the work. Thus, between 1999-2002 Sponge focused on the production of two components of the project: *Sauna* and *TGarden*. The project *TGarden* (which we will focus on here), realized between 1999-2002 in an international co-production between premiere arts and technology venues in the US, Canada and Europe (Banff Center, Ars Electronica, SIGGRAPH, V2 in Rotterdam), is arguably Sponge's most ambitious work in technological, aesthetic and philosophical terms. The project aimed not only to further (and more rigorously) explore the themes of performance and intentional/unintentional gesture whose groundwork was already laid in earlier work but also to develop a suite of sensor-activated, responsive media and computational technologies that would embody Sponge's philosophical concerns. More to the point, *TGarden* attempted to design what Sponge member Sha Xin Wei has labeled "substrate" technologies, where computational processes at the low level would actually percolate upwards to the highest metaphorical and experiential level for the general participants who would visit the environment. In other words, perhaps through the conscious design of such "substrate" technologies (in *TGarden*'s case these included wireless and wearable sensing, responsive materials, software for choreographing continuous room state changes, and physics-based image and sound instruments), the low level (in computational terms) of such substrates would provide the foundation for a different kind of participant experience at the *phenomenal* rather than the cognitive level. As *TGarden* has been written about extensively in other publications [10,11,12] we will provide here only a brief description of the project. Instead, our emphasis will be on the kinds of collaborative methods and work heuristics that arose in the course of the project development.

The initial aim of *TGarden* was the creation of an experimental media environment where small groups of general participants could play with real time generated sound and image through improvised gesture and movement. Its "performers" are the performing public who, within the environment can socially construct and shape media together on the fly based on their own movement as well as the movement and social proximity of others around them. Although adapted to the specifics of individual venues, the general space in which the installation took place is a large (10 x 12 m) performance environment, with real time computer graphics projected onto the entire floor of the performance space and multi-channel spatialized sound.

As visitors enter into the *TGarden* environment, they are escorted to private dressing cabinets where they will find various types of clothing. The clothing itself is designed with specific physical and material constraints in order to interfere with the visitors' standard ways of physically relating to the world. The clothing is also embedded with accelerometers that measure the degree of acceleration, tilt and gravity of each person's movement. Such on the body computing enables the visitors' movement, acceleration and balance to be measured and sent, via wireless Ethernet, to a central logic computer that forms the core of the *TGarden* system

architecture. This logic system interprets data from the sensors (both on the body and room tracking), analyzes what is happening in the overall *TGarden* system and sends commands to the sound and computer graphics systems based on its judgment. This central system ("Oz") contains the microscopic logic of how the environment responds to visitors' actions over various time scales: thus, the system is designed to operate across multiple time scales (person as well as room). The different sound and image systems then modify their own internal states on the basis of Oz's hints and also on the basis of the continuous output from the sensors themselves.



Figure 4: M3 TGarden (Rotterdam, Las Palmas), 2001

What is essential to note here is the reliance on non-rule based, improvised "on the fly" gestures and movement that provides the compositional and performative material for *TGarden*. Gestures and movements are not pre-determined or subjected to a series of rules or behavioral and spatial codifications (i.e., you stand here and this happens). As visitors enter the *TGarden* environment and movement initiates responsive processes of sound and image, the participants gradually become conscious not only of themselves but also how other bodies around them effect, shift and shape the environment. Furthermore, in contrast to many projects where a strong separation exists between performer and spectator, *TGarden* attempts a dissolution of this distinction in order to bring interaction into the realm of haptic, felt and sensed experience. This interaction "close up" can be precisely articulated, for example, in the physics-based models utilized in the *TGarden* software. "Players who expend effort by jumping, bouncing and dragging themselves in space encounter musical and visual equivalents of this physicality in the lowest levels of software: phantom masses and springs, virtual kinetics, friction and energy. Here, in this software physics "the physicality of the performance interface gives definition to the (musical) modeling process itself," writes Joel Ryan, one of the project's collaborators, suggesting that there must be an resonance between the space, interface (i.e., sensors) and software" [10].

The disintegration of the dichotomy between performer and observer is crucial to the overall setup of the *TGarden* project so much so that there exists no singular spectator (either spatially or formally) outside of the participants in the event. *TGarden*'s visitors/players not only engage in an oscillating social game of performing with and watching each other, they also perform with the visual and sonic media that inhabit the environment itself. In this sense, the physical performance space occupied by the public "players" is conceived from the start as a mediated substance that is shapeable by way of social play. By this definition, *TGarden* provides a space to begin investigating how new experiences of spatiality and felt, embodied experience begin to emerge out of computationally augmented environments where the distinction between viewer and participant is interrogated and purposefully blurred.

Outside of its role as an experiential artistic event, the complex development process of *TGarden* also provides a rich example for examining a specific set of methodological issues involved in transdisciplinary collaboration. In terms of these collaborative issues among the different participants during the *TGarden* project, we want to focus here on four pertinent ones: (1) differences in co-present design discussions versus distributed communication in the development-production process, (2) difference of approach in disciplinary languages and individual artist-designer cultures, (3) incorporation of heterogeneous design methodologies and methods and finally, (4) difficulties encountered in the application of techno-scientific research and development paradigms to a project in cultural production.

As in earlier Sponge projects, the extensive development period for *TGarden* involved cross-disciplinary discussion, brainstorming and collaboration with individuals of diverse training and expertise. The *TGarden* development process, however, reached further than earlier work in geographic and disciplinary terms through its joint collaboration with FoAM, a decentralized network of artists and designers sited in Brussels but spread across Europe. The contrast between Sponge's face to face, (i.e., co-presence) practice of concept generation through the consensual domain of verbal and non-verbal language and the distributed, non co-present methods (email, chat, etc) necessary to sustain collaboration with the international team added an additional dimension of complexity to the project.

The second issue arising in the *TGarden* process involved the heterogeneity of disciplinary languages and epistemic cultures that came together to realize the project. Whereas the three main members of Sponge had continually worked on an evolving conversation, the entrance of a wider range of participants and an even wider range of fields (fashion and textile design, computer graphics, physics, etc.) and cultures (scientists trained in the research lab, anti-system hacker-artists, artists used to working in large scale infrastructures) increased the level of working complexity. A collaborative

design workshop held at the Banff Center for the Arts in the winter of 2001, already in the key year of development for the 2001 presentations of TG in Europe acutely points out the challenges of such heterogeneous, transdisciplinary collaboration as well as the different work cultures (hacker culture versus performance production versus students trained in the techno-scientific lab context).



Figure 5: TGarden, Ars Electronica, Linz Austria, 2001

Despite the presence of the boundary object of a performance/installation event (*TGarden*), in essence, the challenges that the *TGarden* team encountered reflect back on the challenges encountered by a so-called *community of interest* in trying to build a shared understanding and common ground. As Ernesto Arias wrote in 1996, "Fundamental challenges facing communities of interest are found in building a shared understanding of the task at hand (which often does not exist upfront, but is evolved incrementally and collaboratively)...Members of communities of interest need to learn to communicate with and learn from others who have a different perspective and perhaps a different vocabulary for describing their ideas. [They need to] establish a common ground and a shared understanding" [1]

Aspects of languaging, different professional cultures and intentions, contextual conflicts and relationships already manifested themselves at the start of the workshop—in essence, a period devoted to construct a set of shared goals for the overall production of the work—and continued throughout the development and presentation process of the project. Such issues point up the complexities inherent in transdisciplinary work like *TGarden*, particularly in the merging together of artistic and techno-scientific goals and intentions in one context.

A further issue arising in the *TGarden* production period was the degree of incorporation of so-called iterative and participatory design methods into the artistic process. By now it is evident that the turn towards artistic projects where user/viewer/player participation is a central feature of the

work has resulted in the increased incorporation of iterative and participatory design methodologies in the domain of artistic practice.

Despite this, the 1:1 transfer of such methodologies is directly complicated by the heterogeneity of disciplinary approaches. In other words, no singular technique or methodology can be said to apply to such complex projects much to the chagrin of those who would see the use of such methods in the conceiving, producing and evaluating of a complex artistic work as comparable to the usability cycle for commercial product development or software design. It goes without saying that the design/production processes for clothing and fashion, engineering and software development and live performance (all of which were incorporated into *TGarden*) have radically different life cycles and requirements. For example, introducing so-called iterative design procedures (prototyping, user evaluation), particularly in terms of continually reevaluating and redefining the project utilizing user testing and feedback was continually complicated by institutional obstacles, including lack of user testing time to accurately tune the system. Along the same framework, user evaluation, one of the central facets of participatory design, was also brought into the *TGarden* process. Partly based on a grant from the Arts Council of the UK examining the constitution of new audience formations in art science creative production, the *TGarden* team undertook an extensive series of user interviews incorporating 1st person methods in the form of video taped interviews. The complexity of evaluating the multi-dimensional axes of experience in the project was consciously integrated into the *TGarden* developmental process due to the project's central reliance on an audience of participants rather than simply observers and the need for real world testing (in the wild) outside of the constraints of the design studio or the lab. This was complicated, however, by institutional conditions.

SPONGE AND THE TOPOLOGICAL MEDIA LAB

A final issue concerns the complexity of combining technoscientific research cycles and cultural production cycles within the same framework. Given that no single framework can sustain such incommensurate practices, in 2001, as faculty in critical studies of technology and media in the School of Literature, Communication and Culture at Georgia Institute of Technology, Sha Xin Wei founded the Topological Media Lab (TML) for art research. Housed in the College of Computing's Graphics, Visualization and Usability Center, the TML has provided a protected space within which students and visiting artists and researchers can build experimental technologies of performance. These experimental works are driven by artistic and philosophical questions, so the heuristics are largely external to technoscience. However, in order to pursue these questions, the TML strategically applies resources at carefully chosen points on the frontiers of engineering and media research.

The TML's goals are neither to produce singular works of art nor to produce singular demonstrations of technology, but to create phenomenological understandings of philosophical questions regarding, for example, gesture, agency, and materiality, substantiated by embodied, holistic experiments in a setting free of the compromises imposed by a performance and entertainment calendar. The TML's fusion of organizational-pedagogical practices drawn from art studio, team-based engineering lab, and performance collective has attracted students from visual arts, digital media, architecture, electronic music, computer science, industrial design, and electrical and mechanical engineering.

CONCLUSION

We have reviewed the transdisciplinary art research collective Sponge as a social organism hybridizing diverse modes of conceptual research and artistic practice conducted at the limits of the respective disciplines. The projects described in the *M1*, *M2*, and *M3* series have tested our questions in experimental settings progressively more embedded in live performance situations. We have contributed modified senses of performance, interaction and response and have introduced other notions such as substrate, materialized conversation and non-egocentric agency that may be useful for carrying on such experimental work. In the next year, we hope to harvest some results from the TML and employ them in a new *M4* series of public experiments and invite other artist researchers to join the material conversation. [19]

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Figure 6: TML test, Membrane (M4), 2003.

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