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Towards a Poetics of Performative Space

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Wittgenstein's skepticism about the expressive scope of propositional language, Derrida's critique of logocentrism, generalized via semiotics to all forms of representation, and Judith Butler's analysis of the performativity of gender motivate the turn to performance as an alternative to representation. In this essay I discuss a series of art installation *cum* performance events called TGardens. These tangible environments' computationally augmented media respond to the improvised gesture and activity of their inhabitants. They were designed as phenomenological experiments about interaction and response, agency, and intention. I describe the architecture of these performative spaces in enough detail in order to be able to address certain phenomenological questions about agency and the continuum of intentional and accidental gesture in the dynamical substrate of *calligraphic* media without grammatical superstructure.

In particular, the return to the performative and the embodied offers an opportunity to reopen questions about the phenomenology of performance and about the phenomenology and poetics of performative spaces that respond to the activity of their inhabitants. These questions concern the thresholds of agency, gesture and intention without reference to a grammatical or rule-based superstructure. Such questions

informed and motivated the construction of a series of experimental media environments called TGardens, envisioned as physical spaces filled with computationally augmented video, sound, and luminous material that respond continuously to the inhabitants' gesture and movement. The TGarden emerged from a conversation among members of an experimental art research group called Sponge, founded by Laura Farabough, Chris Salter and myself in 1997. We had been building experiments exploring what I called deferred (delayed) agency and quantum performance -- performance at the threshold of perception.[1] My colleagues set a challenge to make our discussions about interaction and media tangible rather than let it remain at the level of verbal theoretical discourse, to materialize some of these arguments so that other people could encounter them as powerfully as people have ever encountered theater. In order to understand the TGarden project, one should bear in mind that it started as a poetic response to a conversation extending over several years among artists and theorists affiliated with the Interaction and Media Group seminar at Stanford University, from which Sponge was formed. In 2001, Sponge realized a series of TGardens in collaboration with the FoAM art group in Belgium and the Netherlands, exhibiting the installation-environments ultimately in more than 10 cities in North America and Europe.[2]

Figure 1. Professional dancers in TG2001, V2 Las Palmas, Rotterdam, 2001.

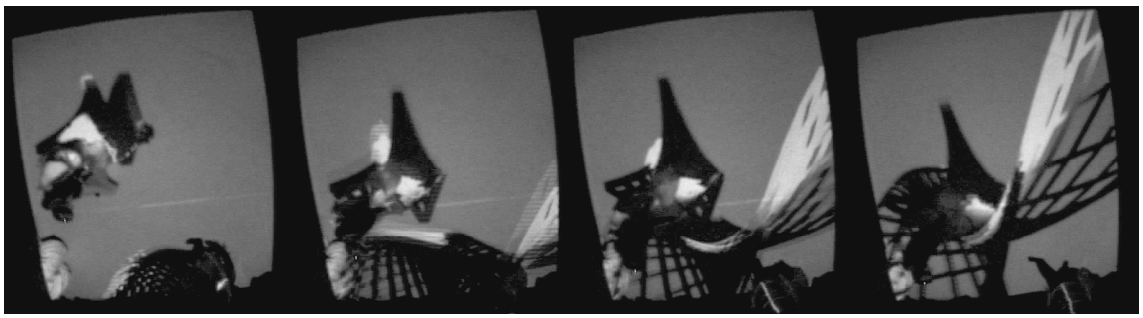

Figure 2. Swapping wings upon close encounter.

For the Ars Electronica Festival in Linz (September 2001), we staged one of the instances of the TGarden -- TG2001 -- as a miniature theatrical event.[3] Before entering the heart of the installation, a visitor chooses from a set of sumptuous garments, each with a different strangeness. Some billow around him in clouds of fabric so that he grows three times larger but no heavier. Some add an odd elasticity to his body so he tends to flop as he walks. He is led into an antechamber draped in black curtains and dressed by an attendant. The attendant belts the pocket computer and battery around his waist and straps sensors of acceleration to his arm or chest. It feels like a medical exam but with a more erotic charge. The attendant tells the visitor little about how to move but suggests that when the visitor dons the costume, he assumes not only a new body but also a new voice. The attendant tells the visitor: listen, move, and attend to what is happening as he moves. Each of these fantastical costumes serves as phenomenological experiment, defamiliarizing the visitor's body so he may more readily improvise gestures.

When a visitor walks into the installation, he notices that there are a few other people costumed unlike him. It is hard to distinguish some of them from the projected visual textures sweeping over every part of the floor and the walls. As he moves he leaves trails of image and sound behind him. The air is filled with a hubbub of sound.

Everything visual and auditory seems somehow made by living processes, but he cannot identify the entities that make them. The room may bear aquatic kinematics, but there are no identifiable creatures of the sea. (The floor is illuminated with projected moving shapes and lines and textures by a video projector mounted 20 feet directly overhead.)

As he waves his arms he notices, perhaps immediately, perhaps after a while that some aspect of the room's aural texture varies according to his movement. But it takes a fair amount of play to begin to understand what is happening. A particular gesture does not always elicit exactly the same sound; it seems as if one is dragging one's fingers or limbs across materials like wool or metal sheet or rubber. If he can learn how to move to generate some desired effect then he can begin to write calligraphically and play as if he were "bowing" through the medium.[4] He can try to create his own “voice” out of the ambient sound field as he moves and dances about. He improvises gestures that elicit meaningful sound or image patterns and develops a personal repertoire of gesture and movement.

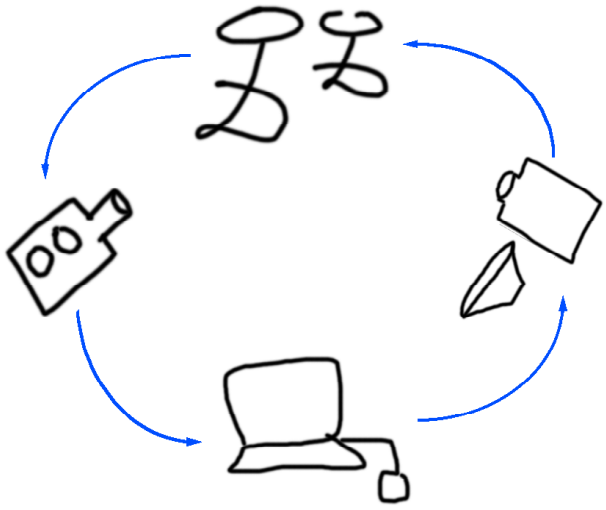

Figure 3. Concurrent circle of processes: bodies; camera, sensors, radio; pc, softwear modules: stat, dynamics, visual+ sound synthesis; sound processor, speakers, visual processor, projectors; bodies. Note that in this case there is no reverse flow because for example, the visitors do not notice or attend to the technology at all. In our aesthetic, we prefer to submerge the electronics entirely below the threshold of perception.

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In a TGarden, each player is associated with his or her own set of computational media synthesis processes, and the entire room is associated with its own process as well. The entire room is considered as but one more player. At the finest scale, the many streams of sensor signals are deliberately designed to include both data from physical sensors (such as acceleration forces) and numerically-derived measures (such as energy or period) in the same processing ontology, reflecting an agnosticism with respect to the distinction between putatively internal and external sense data.

The visitor notices that there are no well-defined objects in the room, but as he plays in it minute after minute, or day after day if he were to return, he learns certain ways of playing that characteristically elicit more or less well defined entities, whether they are acoustic or visual, or socio-psychological objects. He may observe other players who have invented virtuosic ways of playing and engaging the responsive space, and may learn from their more deft action and response. Most of this intertwined activity occurs without verbal exchange. In the imagined ideal situation, as one body passes other bodies, it leaves behind material traces of itself: shadow, hair, echoes, and air currents. Even if one does not explicitly and actively acknowledge a passerby, one's

shadowing matter intertwines with the others' residues, conducting material conversations in the wake of one's passage.

Figure 4. Solo epiphanies. Ars Electronica, Linz Austria, 2001. Courtesy Sponge.

Figure 5. Jump on induced elastic.[5]

One of the key experimental purposes of the TGarden was to explore how we could make possible a compelling experience without relying on pre-scripted, linguistically codable, narrative structure.

Having described the aesthetics of the living experience of this performative space, I pose three phenomenological questions:

(1) How can people coordinate transformative and compelling experiences without relying on conventional linguistic categories such as verbal narrative? The technical analogue to this is: how can people create sense together in a responsive environment without resorting to grammatical structures? This question may seem like a purely technical concern but it has extensive ethical-aesthetic implications. For example, this impels us to seek alternatives to procedural if-then logic and to the locally linear syntax of time-based scripts and scores, including patterns found in conventional genres of interactive art and fiction. The material, one expects, makes a difference.

(2) How could people improvise meaningful gestures collectively or singly in an environment that is as alive as they are, an environment that itself evolves over time as a function of its inhabitant life? Interaction modeled on a particularly reduced notion of computationally mediated action and response is a far cry from animism and alchemy. What I propose to ask is how expressive gestures can be sustained in sensate and animate matter, some of which may in fact be computationally animated.

(3) How could objects emerge continuously under the continuous action of inhabitants in a responsive space? This question of novelty itself comes from a larger critique of technology, which I encapsulate in the motto, "a rich but not complicated life," with a nod to Clifford Geertz's thick, pre-analytic, pre-orthogonalized descriptions of the lifeworld in all of its nuanced fields and relations and influences.[6] But instead of restricting ourselves to observation, in the studio-laboratory we attempt a potentially complicated immanent practitioner analysis. Humberto Maturana and Francisco Varela observed that a continuously self-reproducing autopoietic system cannot draw an objective distinction or operational boundary between exterior and interior stimuli. As Maturana and Varela were generalizing from nervous systems and cellular organisms, it seems that their observation should pertain to any autopoietic system, of which the TGarden was designed to be an example. Therefore the TGarden's creators and players

are by design and in practice themselves participant-observers of their responsive play spaces.

The significance of these three questions about compelling non-verbal play, improvised meaningful gesture, and the emergence of objects from fields is not confined to theater or experimental performance alone. Nor are they merely technical in the sense that they only help the professional performer or creator of performance spaces ply his or her craft. I believe that drawing from the well of performance practice conversely exfoliates and illuminates philosophical questions about gesture, agency and materiality.

In the course of building a TGarden that materializes the phenomenological investigation we uncovered a number of technical questions of which I will discuss three. The first is how can voices be mixed and how a causally individuated voice be foregrounded? The second is how can multiple player agencies sum together? And the third, how can the responsive environment detect the intent of a player? I discuss these questions because they constitute precise, concrete entries into the phenomenological experiment that a TGarden was intended to sustain.

1. Mixing voices.

One of TGarden's purposes is to explore the erotics of the formation and dissolution of bodies from continuous fields of movement, sound, air currents, and video as textured light. Early on, the creators decided that resynthesized sound, being quintessentially temporal, was an ideal medium within which to blend multiple “voices" and sonic textures, so that the movements or gestures of a player would tease out traces in the sound field that the player might associate with his/her own voice. But since sound is an additive medium and diffuses around obstacles, superposing sound works only too well – multiple sonic elements blend into a single field of sound. Similar attempts to

match sounds with individual players in a responsive space typically run aground on the same problem: how can players, the subjects in a dynamic field of audio that they co-create with the music synthesis software, distinguish their own voices in a field of mixed sound? The naive approach would be to assign a pitch or a rhythm or some basic mechanical musical parameter to each person. But this suffers from many problems. For example, fixing a basic musical parameter like pitch flattens the rich potential melodic trajectory that could be nuanced by a gesture. Another problem is that fixing some other obvious or "natural" qualities like harmonic key, a pitch sequence, a signature melody, or acoustic icon quickly becomes impossible to remember or to pick out from a mix of three or more people, unless it is so reduced as to be boringly simple. The creators have always designed the TGarden environments for three or more co-present human players in order to destabilize social dyads and leapfrog communication theory's dyadic paradigm of *atomic sender* + *(message in channel)* + *atomic receiver*.[7] In any event, the engineered system still must have its sensors properly tuned[8] to local physical conditions in order to parameterize the responsive sound synthesis instruments that were created by Joel Ryan and Chris Salter. Of course, much more experimentation remains to be done.[9] The creators deliberately avoided wireless speakers and microphones because the available technology, given the constraints on the budget, labor and wearability, was too coarse for our musical ambitions.[10] Poor sound production makes the game of disambiguating voices from a mixed dynamical sound field that much harder and unrewarding.

To coherently forego *a priori* objects of all kinds, including pre-fabricated visual images and sonic elements, also implies that we should have no predefined narrative objects like characters or voices or even melodies. Performance has come a long way from Pirandello's "personaggi in cerca d'autore" (characters in search of an author): not only have we displaced the authority of the composer by the distributed agency of live

performers and by software logic, now we have even re-arranged and reconfigured the physical and phenomenological locus of perceiving, sensing, listening. Where do the patterned sound and light come from? Where are they produced? How are they produced, and in response to what gesture? In the TGarden a player fashions her own sound out of the total sound field rather than selecting a sound sample that has been recorded or synthesized prior to performance. Generally, instead of triggering pre-fabricated media objects, a player fashions her own dynamical media pattern out of a tissue -- a "stoffa" or stuff -- that is an amalgam of sound, video, fabric and flesh evolving in response to her contingent activity as well as their designed autonomous dynamics. But swearing off *a priori* objects does not mean that no object can emerge under the impact of the players' activity, because a TGarden sustains the nuanced play of emergent pattern and structure. We will see later a positive hint of what the "stuff" of a performative space without *a priori* media objects could be like.

2. Summing Agencies

A second basic technical problem can be introduced via this concrete example: Suppose we project onto the floor, from a single fixed projector, a video texture that is parameterized by an individual's actions. Suppose one person is "followed" by a spot of projected red light and a second person is followed by a blue spot. If these two people arrive at the same location doing different things, what color disk should be projected on the floor "in response" to these two people? That there is a single fixed projector implies that it is the software logic that must decide what color to synthesize for the jointly occupied piece of the floor. In other words, one needs *logical* model that accommodates the *physical* superposition. If the logical model is not constructed to provide for superposition, then the system will either produce blue or red, or some indeterminate result, which used to be the programmers' laconic jargon for crashing the

program. There is no performatively convincing definitive answer to this conundrum. In this case, a heuristic comes to our rescue: focus on transformations rather than objects. Favoring transforms means in this case that we apply visual *operators* (such as "lenses" that burn-in, or "hammers" that optically crack whatever image lies underfoot), operators that are parameterized by the activities of the people. It is much more sensible to parameterize a visual operator by the action of a person, and to add operators together by applying them both to the same set of bits in the streaming video. Let me offer a less minimalist example. Suppose one person who has been in the room only a little while or who has reverted to a "naive" set of gestural activities is associated to an operator that rubs aside the video to expose a different layer of video below it wherever the person is standing. Suppose that a second person is able to cause the video under her feet to swirl with a torsion that is proportional to the bend of her arm. Then when both people are standing close together, they would see the video in a revealed layer, swirling. Of course, the order of application is important but such logic becomes part of the composer's art.[11] But the most significant development in the art of creating responsive environments is the phenomenological, not epistemic, shift of focus from the aesthetic design problem of the legibility of the mark to the intention of the mark-maker.[12]

3. Detecting Intention

Now this algebra of transformations naturally raises the question: how does the system know what the player wants to do? A pinch of philosopher's skepticism can save a large amount of engineering. The nub of the problem is that we cannot unequivocally distinguish intentionality from contingency. Moreover, we cannot unequivocally distinguish lies, quotes, citations, or ironic actions from one another using formal means. After Derrida's and Wittgenstein's interrogations of signification and meaning, it is no longer tenable to defend such distinctions even in principle. Therefore, it seems that we

may as well deploy our engineering resources less cognitivistically ambitious ways. We expand on these points by placing human-computer interaction on stage for a moment.

Paradigmatically, with a well-designed interactive system if you push button A and get response X, then pushing button A again should elicit the same response X or some mechanically obvious successor to X (like increasing volume, or switching a device on and off). This paradigm of interactive design may be useful for utilitarian tasks or simple games of habit but it rapidly grows stale in a performative setting. No matter how much craft is invested in creating a pre-fabricated piece of sound (or image), even if the first time you make a gesture and enjoy the crafted sound, if every subsequent time you hear essentially the same sound when you make the same gesture, then that response becomes boring. In fact, I would say that such a predictable response is not *making* sound but *triggering* a sound effect.

There are multiple ways to fruitfully complexify the response.[13] For example, one can have the software program spawn complex effects like showing a video or moving a robot arm according to an internal clock. But that is formally equivalent to the program acting according to a uni-dimensional script, a generalized timeline. Another canonical technique is to use procedural rules of the form "If a parameter A satisfies condition C, then do B." However, such techniques set us on the slippery slope back to scripted, alphabetically encoded verbal narrative with all of its commitments.[14] Another way would be to randomize the response to some degree. We could debate whether nature truly is random at heart, but that misses the point for performance research. We should remember that half a century ago John Cage and the Oulippo conducted their most interesting experiments with chance in order to question the locus and role of intentionality in the player, the spectator and the system. One of Sponge's working heuristics has been to set aside the use of the random in its compositional process

because, although randomness may be metaphysically interesting, it does not yield any insight on how an intentional nonrandom gesture can be artful.

Rather than playing back prefabricated media objects triggered according to scripts or chance, the TGarden machinery responds like a set of musical instruments responding to continuous gestures, allowing the player to calligraphically brush or violinistically bow through the media.[15] Now a substantial technical problem comes to the fore. Suppose swinging my arm across my thigh pulls a melody out of thin air. I might do that by accident because my arms swing of their own accord as I walk. How would the system know to distinguish between me swinging my arm oblivious to its effect on the sound environment, and me swinging my arm intending to pull a melody out of the air? In fact, this conundrum challenges not only artificial intelligence but also generally what was called philosophy of mind. How can a person or a machine distinguish an accidentally made physical movement from the same movement made intentionally? It seems that we cannot unequivocally make such distinctions among attitudes and dispositions with identical behavioral data.

Given that neither philosophy nor its would-be inheritor artificial intelligence has solved the problem of operationally and mechanically distinguishing the intentional from the accidental, I propose that we design our responsive systems to not make any semantic model of the user's intent. (By semantic model, I mean a rule-based logical and formal system that is populated using the grammar and syntax and the lexicon of an ordinary language.) In fact, I propose the heuristic that the software make no semantic model whatsoever of any "high-level" user state. This means that the computational part of the responsive system should not attempt to model human experience in terms of cognition, or social experience in terms of information, as is often done in the engineering of so-called interactive systems. An interactive system predicated on the dyadic paradigm of turn-taking “communication” omits most of the concurrent density of a live, performative

event. For this reason I characterize TGarden as a *responsive* environment in which all material patterns co-structure each other concurrently.

But it gets worse. An attempt to model the user with so much semantic, psychologistic, or cognitive elaboration is an instance of what one could call a "correspondence error": claiming that a system of representation corresponds to or is deterministically coupled to some objective entity "in the real world" -- phenomenon vs. "entity." After all, a violin does nothing like what artificial intelligence experts would like to build. As you draw a bow across the violin or blow into the clarinet, the instrument does not "decide" or "infer" your degree of virtuosity and change some part of its structure to write a datum labeling you as "novice / amateur / virtuoso," or "happy / neutral / sad." The wood of that violin vibrates according to the same physics whether you are a beginning student or a concert virtuoso. And should you draw the bow in the same physical manner as Anne-Sophie Mutter for some lucky duration, you and the instrument would produce the same sound as Mutter would (though it likely would not be the same music). Beginner's luck, they call it. (Indeed, this is how a human performer develops virtuosity in a TGarden, by playing through computationally augmented physics.) Even if one uses such models without believing in a correspondence, one reifies entities that progressively bog down or schematize expression as they accumulate transcendental status.

In the TGarden, we set ourselves the challenge of creating physicalistic systems[16] that provide enough richness and depth of response to always make experientially distinguishable and potentially interesting responses to the player's action and movement, no matter what the player does. No matter how you drag that bow across the strings, the violin will sound. It is up to the player to make "strokes" and create gestures, to develop facility through continued practice and to inscribe or ascribe meaning by inscribing media.

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I have written about the relation between gesture, agency and materiality elsewhere so let me make only two critical comments here about the consequences of these relations for gesture in a TGarden. [17]

Given the tangible, responsive media of a TGarden, we can begin to understand how gesture conjures the self and how collective gesture conjures the social. One of TGarden's principal motivating themes is the dissolution and re-formation of bodies in a field. When this field is a social field, then the act of gesturing becomes a way to shape intentional being in the world from a state of non-intentional distraction. At a larger scale, since our gesture is conditioned by birth, habit and culture, gesture entangles social history with the body in action. Not only our own personal histories but also the habits of generations sediment into our own bodies as disciplines that fluidly scaffold our gestural expectations, anticipations and intentions. The technology of performance allows us to play most tangibly with such processes of individuation.

One of the technical interests of the TGarden is to study how people could improvise gestures meaningfully in a media-rich space that evolves continuously in response to their activity. We have built a performance space with instruments that enforce no syntax on the player's gesture. Without syntactic constraints, there are no wrong movements and every movement "does something." In place of syntax and grammar, we have built a responsive environment that tangibly connects people's gestures and movement to one another and to the environment: every glide, every stroke, every slip and slide, stirs media processes in tandem with the physical material world. In a deep sense, it is the *ontological continuity* of the TGarden's media processes that enables improvisation and performatively rich nuance. The exploration of continuous ontology is a joint investigation with Niklas Damiris.

This continuity has strong phenomenological consequences. Continuity is a leitmotiv of topological media and the heuristic lens into the full, thick dynamics of our embodied experience. As you sweep your arm it moves continuously through the air. As you walk to your friend to greet her, your consciousness has no gaps. In everyday experience, your existence appears to have no gaps. As human experience is dense and continuous our creations should sustain playfully intensified experiences that, in my terms, are not complicated but rich.

Since we TGarden designers wanted to sustain such phenomenal density in our own play space, we made software media engines that synthesize time-based video and audio. These engines, especially the sound instruments, allow players to dissolve, re-constitute, and shape perceptual entities under the impact of their individual and collective activity. Making a media engine that evolves continuously also radically reduces the complexity of the media elements that need to be assembled for production because media can be synthesized afresh in response to the activity during an event. In fact, we pre-fabricated relatively few media objects (i.e. video or sound files) for TG2001, because we only needed them as initial textural material to seed the processes that re-synthesized dynamic fields of sound and image in real-time performance.

What is the medium of gesture in this extended dynamical setting but continuous and open material, that is a *topological* medium?[18] We use topological media not to represent some abstraction, but as the substrate of performance and physical action itself, an expressive tissue amalgamated from gesturing flesh and re-synthesized video and sound. Where Grotowski challenged actors to use their own bodies as their expressive medium, in studio-laboratory work I take as my challenge creating computationally mediated matter for expressive *presentation*.[19] Analytic sciences and philosophy may be less attuned to this non-representational use of matter because matter, whether ink and paper or fabric, has tended to be regarded as part of dumb nature, the object of mere craft

(not art). Literary theory and till recently cultural studies may gain analytic purchase on matter only so far as it can be traced as linguistically signifying matter.[20] Matter, topologically construed and topologically constituted, may serve as the substrate of poetic expression.

Figure 6. SOLARIS, Soderbergh.

I sometimes characterize the empirical practice of the Topological Media Lab as a form of materials science. Adopting the more modest spirit of making a textile rather than a jacket, one can ask what would play the role of the "textile" opposite to the "performance-event"? It would have to be the hybrid media, the hybrid, dynamical, responsive fields out of which particular narrative objects and event sequences emerge. I call these fields the *substrate*. The TGarden technology constitutes not a particular event action sequence like a stage play or a game, nor even a generalized language, but the substrate to a continuous range of performance. I should emphasize that I do not wish to use substrate in its ordinary sense of being prior or more foundational than its objects or events, but in the sense of the physics of fields. The substrate is constitutive of the

objects and events that form in it; in other words, the substrate and its contingent objects occupy the same ontological stratum. So, objects do not emerge out of the substrate, objects emerge in it. The substrate is immanent in its dynamically forming and dissolving objects.[21] What this offers performance is an alchemical technology for poetic matter. Such technologies of, for example, gesturally nuanced realtime video and sound synthesis, and of responsive, sensate and luminous electronic fabrics comprise contemporary amplifications of the technologies not of representation but of performance.[22]

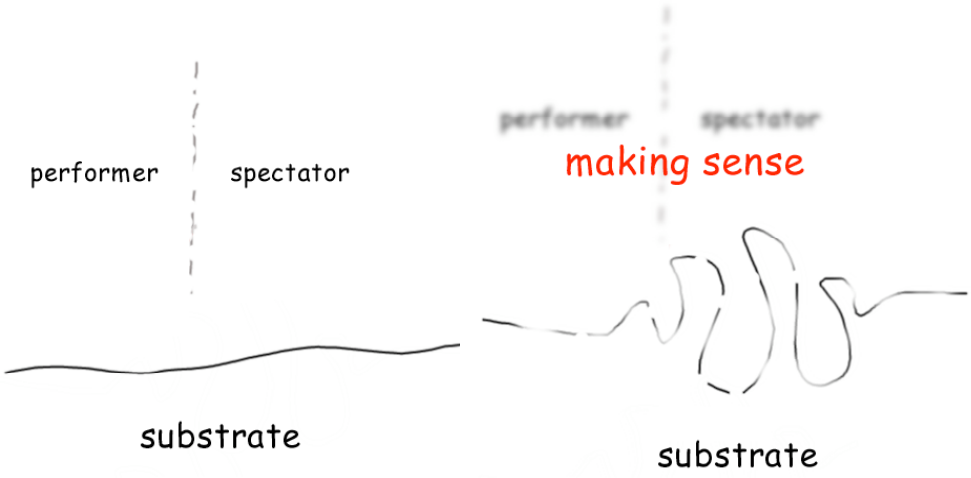

Figure 7. Substrate to sense-making (gestures) in performance. From Sponge Ambient document, 1999.

Having developed this notion of the substrate, we can re-examine the three related questions about the phenomenology of performance that I introduced earlier in this essay: *(1) How can people coordinate transformative and compelling experiences without relying on conventional linguistic categories such as verbal narrative? The technical*

analogue to this is: how can people create sense together in a responsive environment without appealing to grammatical structures?
(2) How could people improvise meaningful gestures collectively or singly in an environment that is as alive as they are, an environment that itself evolves over time as a function of its inhabitant life?
(3) How could objects emerge continuously under the continuous action of inhabitants in a responsive space? This question itself comes from a critique of technology that falls outside the scope of the present essay.

As we have seen, people can signify and create sense in their material, ambient substrate without recourse to any linguistic representation. Moreover, this improvisatory signification can be responsive and collective. As for the second question, I argue that the continuity and density of the substrate, and co-structuration that permits infinitesimal variations from a point, lend themselves to easy improvisation of significant gesture. People can improvise gestures as they already always have in continuous media like water or snow. And third, objects can be re-interpreted more contingently as variations in local densities, concentrations, or even as invariants under some set of transformations.

From "What is the Human?" to "Where is human?" and "How to human?"

By this point, it may be apparent that the TGarden project constitutes an experimental exploration of subjectivation, in Guattari's sense. In order to conduct this exploration in the mode of experimental performance research, we focus our attention on the amplification of metaphorical gestures by co-present humans performing in a common responsive, alchemical medium. In order to query or re-fashion the fold between nature and artifice, signs and matter, ego and other, I have wagered that we must create (as we have) a responsive medium as a *continuous* amalgam of the forms of matter that are

accessible to our craft, whether computational or physical: projected light, organized sound and video, fabric, choreographed flesh, speech, software. What we must and have set aside are certain categories such as the cogito as well as the body because in order to understand such ontological or phenomenological categories it greatly helps to transgress those categories' boundaries rather than assume them *a priori*.[23]

But how could we bracket the body phenomenologically, and what are the consequences of such a bracketing? To bracket the body is not to deny or to hide it but in fact to pay attention to its framing condition. In general I find it helpful to imagine the world not as a vacuum raisined with corpuscles but as a plenum of varying density. With such a field-based approach, the body then becomes a local density whose boundary is implicitly and provisionally defined by contingent anticipation or imagination and by the expectations formed in the course of contingent performance.[24] Of course it follows that these densities and boundaries vary over time, from moment to moment, and from disposition to disposition. A set of pedestrians' or dancers' limbs moving in tandem could form a body, as could a group of voices momentarily syncopated. What we ought not assume however is an invariant deterministic mapping from physiological data to metaphor. Although an invariant mapping may be a necessary working notion for neurologists and linguists and engineers, we need not and should not as poets, or as phenomenological experimentalists assume a discernable deterministic relation between physiological data like heartbeat, galvanic skin response, or breathing rate, and macroscopic objects of performance like emotion, mood, or narrative entity. Pragmatically, what we learn from neurophysiology and the principled scientific study of neural phenomena is that the data are simply too complex and polyvalent to plausibly map to any simple linguistic token of an emotion or some human behavioral state. A smile could correlate with amusement, embarrassment, confusion or the rictus of death. A spike in the nervous signal of a muscle could correlate with an equally great variety of

putative "causes." But beyond such pragmatic concerns, there is a more fundamental conceptual issue. Such a mapping would be merely a trace of the physical other, which is not identical, and may have only accidental relation to the embodied phenomenal experience, or, to borrow from Varela, Rosch and Thompson, embodied enactive experience. It is true that an artist may intentionally impose a mapping, but the art of a TGarden lies in the fashioning of a substrate, not any particular object in a particular event.

But to unmoor (lift anchor from) bodily preconceptions and to free the actors' flesh from pre-designed "mappings" of cause and effect, a TGarden should provide extra modalities of flesh in addition to the ordinary flesh of the performer-player: for now, the modalities of gesturally modulated light, sound, and fabric. If you move, your skin shrugs over the bones of your hand not in a dialogic response to your action, but as the locus of intentional imagination fused with the physics of muscle and bone. In the same way, we create our calligraphic video, sound and fabric not as pre-carved masks or prosthetic devices, but as expressive tissue that can be charged and recharged with latent, potential responsivities to gesture and movement. Continuity of media and body, whether effected by techniques of camouflage and projection or by haptics and sensors and active cloth, leaves open the boundary of the performing body in the way that helps us as experimentalists in performance research to explore just such bracketings of the body.

Now, having suspended the *body* in this sense, what if we bracket the *cogito* as well? What if we bracket not only the cogito but also the ethico-aesthetic and desiring Subject? Deferring presumptions and models allows us to see how subjectivities emerge under the dynamics of co-present play and what becomes of agency? As designers of responsive play spaces we can ask, where should we locate the causal agency of a human-machine system? The TGarden's media choreography system, the gesture

sensing and media re-synthesis system that produces the responsive sound and video with behaviors that evolve in the course of play, enables designers to distribute agency in a much more fine-grained way through the different components of the media architecture, but it evolves with agency of the human players as well. Indeed, this challenges media composers who must relinquish total control of their media logic to unanticipated responses of human visitors, yet the composer must design evolutionary logics yielding experiences that feel more engaging than accidental pastiche. In my view, one condition for an aesthetically compelling experience in a TGarden is that it should not induce puzzle-solving behavior. I wish players to never have to think about how everything works. This cognitive response has become almost inevitable among experienced consumers of interactive games because that is how we have come to expect to play with a machine. But puzzle-solving is a poor substitute for theater or any thick form of life. More fundamentally, puzzle-solving ferociously re-inscribes only cognitive acts, and a particularly reduced set of such acts at that.

In sum, TGarden is a performative space in which people can playfully improvise gestures to collectively or individually create meaningful patterns out of fields of dynamically varying light sound, fabric and bodies. The media synthesis processes develop continuously according to a field-theoretic, magic physics without propositional logic, schema, or symbolic computation. The media fluidly evolve according to autonomous processes as well as and in response to the players' activities. The continuous shaping of the responsive media follows definite, composed metaphorical topographies that give a characteristic potential to the experience in a particular aesthetic, performative event. One might say that the potential dynamics created by the composers of a particular TGarden play space are a collective social gesture eliciting a collective response from the ambient social world, not a specific set of calls and responses a la

Disney imagineering, but rather a topological substrate of latent, potential response, the stuff of the imaginary.

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Endnotes

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[1] *Some of the critical concerns of this essay date from a seminar in interaction and media that I coordinated at Stanford from 1995 to 1997. Thanks to participants of the Interaction and Media Group, whose earliest members included Niklas Damiris, Helga Wild, Alice Rayner, Anne Weinstone, Ben Robinson, Larry Friedlander, and Diane Middlebrook.*

[2] *Sponge's installations were originally impelled by questions about the phenomenology of performance, such as: What symbolically, affectively charges an event? And, how and why does a gesture make meaning? If we provisionally bracket verbal narrative and invite nonexperts to improvise movements that nuance time-based media in a common performative space, then how can we possibly sustain experiences that are as compelling as the works of Bertolt Brecht, Heiner Mueller, Jerrzy Grotowski, Eugenio Barba, Robert Wilson or Pina Bausch? One can consider this as a finely tuned question sounding in the methodological silence left by Antonin Artaud's call to liberate theater from the tyranny of the text, from what he disparagingly called dramatic literature. In what sense, and to what degree this is possible may be questioned, because, as Derrida argued in his essay on Artaud, "Presence, in order to be presence and self-presence,has always and already begun to represent itself. ("The Theater of Cruelty and the Closure of Representation," in Writing and Difference, Chicago: U. Chicago Press, 1978, p. 249.)*

Nonetheless there have been diverse responses to Artaud's challenge over the past century in experimental theater. Collectives such as Sponge in North America and FoAM in Europe, and the university based Topological Media Lab for art research and

speculative engineering are using the emerging technologies of computational responsive media in a systematic and idiomatic way, using insider knowledge and adopting practices from techno-scientific research and development. Although there is much to be said for cargo cult approaches to technology, I do not take the technology of electronic devices, protocols and software for granted as naturalized, shrink-wrapped black-boxes. I pursue this material, embodied craft as a way to open the ground for critical and artistic practice. At the same time, I maintain that we need to remain acutely conscious of the epistemic frames constructed and imposed by techno-scientific practice, a task which becomes more challenging the more deeply we enter the black-box.

Over the past five years, my work with these performative spaces has been guided by the demands of performance research, particularly questions concerning the phenomenology of performance. I distinguish performance research such as TGarden from making a particular performance-event-installation or an aesthetic object such as the TG2001 event that the TGarden consortium exhibited in Ars Electronica and V2.

FoAM was founded in 2001 by Maja Kuzmanovic, with Nik Gaffney, Lina Kusaite, Cocky Eeck and other artists and engineers.

See Sponge http://sponge.org and FoAM http://f0.am for links to TGarden, txOom, Moob, and trg responsive space projects that derived from the TGarden architecture.

[3] In this essay, I borrow the type-token distinction: "TGarden" will refer to the concept and the research project, and "TG2001" will refer to the instance that was exhibited in 2001 in Austria and the Netherlands.

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[4] *I adopt the notion of "bowing" through responsive temporal media from Joel Ryan and Chris Salter. Ryan was the principal designer and creator of the sound instruments for TG2001, and Salter co-designed the sound environment.*

[5] *Induced tangibility: in the example shown in the TGarden video entitled "hopskip," the rhythmic beat of the background sound entices the player to jump. The accelerometer maps the jump to the 3D graphics, which in turn opens and closes the wing. Since the wing's membrane is parameterized by accelerometer data, its dynamics are directly inherited from the dynamics of the jumping body. The player interprets the dynamics as elasticity that he ascribes to the projected graphics, which encourages him to leap about the floor as if it were a trampoline. Two facts: the latency is low enough so that this all seems concurrent. No physics is simulated in the software -- the dynamics come directly from the physics of fleshy bodies under physical gravity.*

[6] *Complexity has often been valorized as yielding phenomena emerging from large collections of discrete entities in networks of relations modeled on graphs, phenomena that one does not observe in an individual entity. However, I maintain that complexity does not equal richness, just as panoply of choice does not equal freedom (as anyone encountering the bewildering array of differently processed coffee beans in equally tasteless combinations of flavors could attest). Indeed complexity inevitably tends to overwhelm sense and value. For efficiency, I motivate this by a formal argument. Suppose a discrete set S contains exactly N elements. One says that the size of S is N. The set of all subsets of S, called the powerset of S, generally has larger size than S. In fact, if S has cardinality N, then its powerset has size 2^N, generally a much bigger number than N. If S has ten elements, then it has about a thousand subsets. If S has twenty, then*

it has more than a million subsets. In other words its powerset is exponentially bigger than itself. Generally, discrete structures exhibit this sort of combinatorial, exponentially explosive complexity as you add more elements, components, or dimensions to the structure. The same is true of networks of discrete nodes and arcs. As these networks grow larger, we can attempt to salvage the situation by aggregating sub-graphs into nodes but that merely defers the explosion by one step. Eventually combinatorial complexity overwhelms us. On the other hand, if we believe that human experience is continuous, dense and rich but not combinatorially complex, then it should be a healthy challenge to try to make our performance technologies themselves topological rather than combinatorial.

To elaborate the topological is the subject of a larger project, but suffice it to say here that a topological approach makes concrete sense of continuous, dense and rich media. Indeed, a technical part of my research agenda -- in the older sense of techne -- is to understand and create such topological media for artistic applications.

[7] Joel Ryan and Chris Salter have worked intensely on this and have invented some promising strategies, described in "TGarden: Wearable Instruments and Augmented Physicality," Proceedings of the 2003 Conference on New Interfaces for Musical Expression (NIME-03), Montreal, Canada, NIME03-87.

[8] Tuning, in this context, refers to the delicate process of finding the regions in parameter space corresponding to the most sensitive, salient, and expressive sensing and response of a responsive media environment. For example, a flexible sensor may report bend ranging from say, 0 to 90 degrees, but it may be most sensitive (i.e. report values that change most rapidly for a given increment of physical flex), most accurate, and most

repeatable only in a sub-range of physical flex. In order to make a medium respond most palpably to flex using that sensor, the software systems mapping physical flex should use only the numerical data that is reported from the particular sub-range, using a mapping that is invariant (or at least predictably variant) over a range of repeated trials.

[9] We are starting a new circle of research with expert musicians in the area of gesturally controlled electro-acoustic instruments such as members of STEIM, the center for electro-acoustic musical performance, in Amsterdam.

[10] In a different direction, Benoit Maubrey and Die Audio Gruppe have created witty and whimsical public performances with simple electronics that record and process sound directly on the body of the performing "audio ballerinas."

[11] Of course, not every example is taken from actual performances. But since we have built a performance engine, I am careful to describe examples of system responses that we have built in prototype form and can easily flesh out in performance with the existing apparatus. In the few places where the described experience is speculative, I clearly state it. To see the TGarden systems in action, please visit the TML website and look at some of the video documentation. Much of the performance-installation videos were taken in 2001-2002. Later video documentation shows the much enhanced responsive media system that we have built since then in Atlanta.
http://www.sponge.org/projects/m3_tg_intro.html or
http://topologicalmedia.concordia.ca/tgarden/index.html .

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[12] *More precisely but also more conceptually, we move from the base manifold of observables to a space of transformations on that manifold. Briefly and informally, "observables" are the set of varying parameters reported by sensors tracing the physical activity or state of the people and the environment during an event. These parameters can vary through a range of values in a non-Euclidean space, a "base manifold" whose potentially high dimension and complicated shape reflect the in principle arbitrarily complex set of physical observables. From an idealist perspective of classical physics of mechanical systems and more radically, of quantum mechanics, the event is identified with what can be observed via some experimental instrument, whether an organic sense or an extension of the senses. Esse est percipi. But rather than rest with descriptions of the physically observable configurations of matter and media, the TGarden is designed around the notion collections of transformations that act on, or modify, the environment. These collections may be construed as sets of transformations on the manifold of observables.*

[13] *I say complexify, not enrich, because I believe that such combinatorial approaches inevitably make the user experience more complicated, but that our experience in the world can be rich without complexity. In other words, richness is not synonymous with having numerous discrete choices, and numerous discrete possibilities. My colloquial example is: presenting a customer with 100 different variants of coffee at a coffee stand does not sum to a rich experience of drinking coffee.*

[14] *I use the term "alphabetic," thinking of Brian Rotman's Derridean critique of the linear semiotics that derives from alphabetic representations of language. He terms the literary analysis bound conceptually by such artifacts, which thinks of all communication*

and ratiocination and creation as reducible to that which can be represented, or more extensively, conducted in alphabetic text, the "alphabetic dogma."

[15] I thank Joel Ryan and Chris Salter for their insights in the musical use of gesturally-inflected electronic sound synthesis.

[16] I say physicalistic to emphasize that these use the same sort mathematical and software methods that are used to simulate "real" world physical processes. But since we are seeking expressive power and enough phenomenal richness or tangibility to sustain high symbolic charge, there is no need to mimic physical reality. It has to be as rich as the ordinary physical physics, but it can be different. For example, one of my students, Yoichiro Serita, implemented a wave equation model that we could apply to live video streams. Then frame-differencing gave us the effect of ripples that appeared only where we moved. But then he modified the kernel to be a function of position, which made it possible to make the waves flutter like cilia along contours around a thickening of a path, something that was as rich as some "naturally occurring" process, but one that you would never observe in a physical lab.
Jos Stam, in his work with fluid dynamics for game design, articulates the strategy of pursuing visual plausibility rather than adherence to "accurate" physics.

[17] Sha Xin Wei, ""Resistance Is Fertile: Gesture and Agency in the Field of Responsive Media,"
Configurations - Volume 10, Number 3, Fall 2002, The Johns Hopkins University Press, pp. 439-472.

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[18] *See the discussion of gesture as an open relation in Sha, "Resistance is Fertile," 2003.*

[19] *I thank Helga Wild for the formulation of presentation vs. representation.*

[20] *Naturalizing matter as dumb substance parallels what Bruno Latour identified as sociologists' tendency to naturalize scientific objects. (We Have Never Been Modern (Cambridge, Mass.: Harvard University Press, 1993)) More than ten years later, science studies has largely responded to Latour's call for the symmetrical disposition towards social objects and natural objects, but this symmetrization is still slowly percolating into neighboring domains in cultural and literary studies and philosophy.*

In a sense, the discussion of gesture recalls the discussion of the nature of light and vision prior to relativity theory. Prior arguments about the existence or non-existence of ether as a medium which conducted light were subsumed by arguably Einstein's deepest insight, the equivalence of geometry (in the sense of geometrodynamics) with the distribution of matter-energy. In geometrodynamics, the material medium is also the geometry of space, so that a signal, being the rarefaction and compression of physical matter, is simultaneously a time-varying informatic fluctuation as well as a material fluctuation.

[21] *In some ways, substrate is a suggestive concept for what Deleuze and Guattari described by a-signifying BWO -- Bodies Without Organs* (I am indebted to Arkady Plotnistky for clarifying this notion's relation to BWO.) *An emergence can be seen either as a change in intensity to use Deleuze's concept of change, differentiation vs. differenciation -- or as a concrescence, to use Whitehead's way of .*

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[22] *See, Sha Xin Wei," The TGarden Performance Research Project," to appear in Modern Drama 2005-2006.*

[23] *It may help to compare this with the modern investigation of intelligence. The Enlightenment's formation coincided with a fascination with the boundaries of the human represented by such quasi-objects as Wolfgang von Kempelen's chess-playing automaton of 1770 (Tom Standage, The Mechanical Turk, (London: Allen Lane, 2002)). In the first age of the electronic computer, one of the grand challenges computer scientists set for themselves was to build a computer that could play chess better than any human. Such a specialized quest was justified on the grounds that exceeding the cognitive limit of the human in this dimension could yield insight into the extent and even the structure of human cognition engaged with this sort of puzzle solving. In a parallel but rather more substrate and materialist mode, I propose to bracket the boundaries of the human in order to understand not so much the what but the how of the human experience: I would ask not "What is a human?" but, to borrow Anne Weinstone's phrase, "How to human?" One conventional limit of the human is the fleshy body, so let us bracket it.*

[24] *In fact, it is in this sense that I interpret Deleuze and Guattari's Body Without Organs. See note 21.*