

Emergent Improvisation

Solo Practice

Embodiment

Sensory Work:

Moving from Breath, Stillness, Body scans, Body Mapping, Proprioception, Tuning

Discovery of Movement Vocabulary

Initiation from Body Parts, Rhythmic Patterns, Musicality, Phrasing, Timing, Deconstruction, Speed, Repetition, Body geography, Internal Imagery, Sudden Changes, Interruptions, Retrograde, Energy States, Fluid Systems

Attention to Spatial Environment

Spatial Orientation and Boundaries, Architecture, Sound, Light, Temperature, Energy, Internal and External Sense of Time and Space, Finding Location, Foreground/Background, Spatial Patterns

Focus on Particular

Choice, Beginnings/Endings, Narrative/Images, Referencing, Phrasing, Assembling Patterns, Repetition

Emergent Structures

Excavation, Accumulation, Initial Conditions, Theme and Variation

Ensemble Practice

Communication

Ensemble Capacities for Self Organization:

Pattern Recognition, Negotiation of Roles, Empathy Attention to Development, Balancing Individual Impulse with Ensemble Choice Making

Compositional Tools

Unison, Spatial Patterns, Solo/Chorus, Framing, Retrograde, Rhythmic Patterns, Narratives/Images, Amplification, Repetition, Referencing, Interruptions, Sudden Changes, Entrances/ Exits, Stillness, Accumulation, Shadowing, Partnering, Contact

Emergent Structures

Washes, Charges, Main Event/Chorus, Glacial Erratic, Waves and Eddies, Pathway, Landscapes, Fields, Tableau

Emergent Forms

Complex Unison Form, Memory Form, Recall Form
Forms in Development: Landscape Form, Dream Form, Rhythm Form

Emergent Improvisation: Practice and Performance

The practice and performance of Emergent Improvisation addresses the nature of improvisation in dance and music. In this context, improvisation is understood to mean the spontaneous creation of integrated sound and movement by performers who are adapting to internal and external stimuli, impulses, and interactions. Ordinarily, we think of order and form as externally imposed, composed, or directed. In this case, however, new kinds of order emerge, not because they are preconceived or designed, but because they are the products of dynamic, self-organizing systems operating in open-ended environments.

This phenomenon--the creation of order from a rich array of self-organizing interactions--is found not only in dance and music, but also, as it turns out, in a wide variety of natural settings when a range of initial conditions gives rise to collective behavior that is both different from and more than the sum of its parts. Like certain art forms, evolution, for example, is decidedly improvisational and emergent, as is the brain function that lies at the heart of what it is to be human.

Emergent forms appear in complex, interconnected systems, where there is enough order and interaction to create recognizable pattern but where the form is open-ended enough to continuously bring in new differentiations and integrations that influence and modify the form. It is by way of these interactions that particular pathways for the development of new material are selected.

In linking the creative work of art-making to the emergent process evident in nature, there is basis for a rich and textured inquiry into how systems come together, transform, and reassemble to create powerful instruments of communication, meaning, and exchange. Emergent Improvisation explores the ways in which natural processes underlie artistic expression along with the possibility that art can help illuminate natural processes.

CONVERGENCE: THE EMERGENT IMPROVISATION FILM

BY ELLIOT CAPLAN AND SUSAN SGORBATI

July 15, 2010

Introduction

Filmmaker Elliot Caplan and choreographer Susan Sgorbati propose making a dance film that merges essential qualities of emergent improvisation in dance, music and science with potentially innovative techniques in filmmaking. The purpose of the film is to reveal emergent improvisation structuring principles through movement and cinematography in order to inform a wide audience of its diverse applications. The film will accomplish this through dance, imagery and a series of interviews with distinguished scientists with whom Susan has collaborated on her supporting research.

What is Emergent Improvisation?

Emergent improvisation is a self-organizing structuring process in which initial conditions (rules for movement, time and sound) give rise to collective forms or patterns. Emergent forms appear in complex, interconnected systems, where there is enough order and interaction to create recognizable patterns, but where the structure is open-ended enough to continuously allow new differentiations and integrations that influence and modify the form. This phenomenon – the creation of order from a rich array of self-organizing interactions – is found not only in dance and music but also in a wide variety of natural settings. Evolution, for example, is decidedly improvisational and emergent as is the brain function that lies at the heart of what it is to be human.

Goals of the Film

In linking the creative work of art-making (movement, sound, film) to the emergent processes in nature, there is basis for a rich and textured inquiry into how systems come together, transform and reassemble to create powerful instruments of communication, meaning and exchange. This project explores ways in which organic processes underlie artistic expression along with the possibility that art can help illuminate these organic processes.

This film will reflect the meaning, importance and beauty of emergent improvisation and its application across disciplines in Art and Science. It will accomplish this goal by examining two emergent forms through dance and narrative, film imagery, and interviews with scientists.

In the initial stages of filming, showings will occur in several university venues for discussion and feedback. These are Middlebury College and Bennington College in Vermont, Williams College and Massachusetts Institute of

Technology in Massachusetts, Sarah Lawrence College and University at Buffalo in New York. At the completion of the film, venues will be not only in university settings, but the theater at The Neurosciences Institute in San Diego, The New England Complex Systems Institute in Boston, and artistic presentations, such as Lincoln Center Performing Arts Library series. The widest possible audience will be sought in order to stimulate dialogue and discussion of these concepts.

In the film, Elliot Caplan and Susan Sgorbati will work with twelve dancers (all professional: five from the Trisha Brown Dance Company, one former member of Merce Cunningham Dance Company, one current member of Susan Marshall Dance Company, and five graduates of Bennington College who now dance professionally). They will also be working with Cornelius DuFallo's Ne(x)tWorks music ensemble, based in New York City, for rehearsals, future performances and potential sound score for the film.

Two New Forms in Emergent Improvisation

Sgorbati's research into emergent improvisation enabled her to develop a series of experiments in which she could observe dancers signaling each other in self-organizing structuring processes, similar to the communication between musicians in a jazz ensemble. This experience of witnessing new "emergent" forms among an ensemble of dancers and her conversations with scientists led her to develop structuring principles that created the two emergent forms that will be examined in the film:

In the ***Complex Unison Form***, open-ended processes are constantly adapting to new information, integrating new structures that emerge and dissolve over time. *Complex Unison* reveals the progression of closely following groups of individuals in space, to the unified sharing of similar material, and finally to the interplay of that material, which has both a degree of integration and variation, often displaying endlessly adaptive and complex behavior. Complex Unison Experiments are:

a) Complex Unison based on solo dancer material, small group material, and global ensemble forms that build from simple patterns to complex ones. How these forms can be read topologically, seeing solo, small group and ensemble on their own and then simultaneously, forms nested within forms.

b) Variations on shifting landscapes are created, shifting spatial patterns, qualities, speed and textures, numbers shift (maybe even real environments shift, such as same spatial pattern, one in desert and one in wetland, etc)

c) Adaptation: small groups execute patterns, two drop out of patterns, the patterns adjust with two less dancers.

In the ***Memory (Remembered Present) Form***, the dancers and musicians create an event that is remembered by the ensemble, and then reconstructed over time, revealing memory as a complex structuring process. This process investigates multiple interpretations that draw on signals that organize and carry meaning. In this way, memory of the initial event is a fluid, open-ended process in which the performers are continuously relating past information to present thinking and action. Inspired by Gerald Edelman's concept of "the remembered present," this reintegration of past into present draws on

repetition, nonlinear sequencing, and emergence to construct new adaptations.

The Memory (Remembered Present) Form Experiments are:

- a) An event is created with the dancers in a specific location
- b) The event is repeated, other dancers replace roles
- c) The event is repeated with multiples in certain roles
- d) Parts of the event are revealed differently by the camera
- e) The event becomes more complex based on what is revealed, what is repeated, what is reconstructed, what is changed, and the interactions around the original memory.

Developing these new emergent forms also gave Susan insight into what kinds of questions might be useful to ask about structuring principles across disciplines.

These guiding questions can be found in Attachment A.

Short History of Project

Susan Sgorbati created the emergent improvisation form in collaboration with three distinguished scientists, who will consult and be interviewed as part of this film: Dr. Gerald Edelman, Nobel Prize winner and Director of the Neurosciences Institute in La Jolla, California, Dr. Stuart Kauffman, a MacArthur recipient, formerly of the Santa Fe Institute and now Director of Biotechnology and Informatics at the University of Calgary in Canada, and Dr. Bruce Weber, evolutionary biologist, and former Woodworth Chair of Biological Sciences at Bennington College.

Susan spent three winters in residence at the Neurosciences Institute under the tutelage of Dr. Edelman. Dr. Kauffman spent time at Bennington College collaborating with Sgorbati in the dance studio and giving lectures. Dr. Weber co-authored with her the essay, "How Deep and Broad are the Laws of Emergence" and created several classes with Sgorbati that they taught at Bennington College. Her work with all three scientists inspired research that resulted in the creation of two movement forms, a process initially supported by a grant from the Jerome Robbins Foundation.

Susan's forms were performed by a company of professional dancers and musicians on a 2005-2006 national tour that also featured panel discussions and conversations with scientists. The tour was initially funded and supported by The Flynn Center for the Performing Arts and by the Creation Fund of the National Performance Network. The Creation Fund is sponsored by the Doris Duke Charitable Foundation, the Ford Foundation, Altria, and the National Endowment for the Arts. The performance tour got additional support from the Bumper Foundation and Bennington College. Not only was the work critically acclaimed by artists and dance critics, but Susan discovered that the scientists were genuinely interested in the work and responded to the performances with excitement, questions and interest in future collaborations.

An Aesthetic Idea, A Scientific Idea

In the context of this project, improvisation is understood to mean the spontaneous creation of integrated sound, movement and cinematography by a

filmmaker and performers who are adapting to internal and external stimuli, impulses and interactions. Ordinarily, we think of order and form as externally imposed, composed or directed. In this case, however, new kinds of order emerge, not because they are preconceived or designed, but because they are the products of dynamic, self-organizing systems operating in open-ended environments.

The science behind emergence and self-organization (see Attachment B) resonates with improvisation in dance and other arts. Common themes can be observed in both fields of endeavor: Emergence is a property that arises out of self-organizing ensembles. Movement is an essential component of the self-organization. Constraints are necessary as are boundaries of time and space. Structuring principles dictate the type and nature of the emergence; they are found in a unique ordering that is a relationship between integration and differentiation. These shared observations led Sgorbati to speculate that there are deep, structuring principles that underlie a vast range of phenomena, producing similar evolving patterns in different environments: dancers collecting, birds flocking, visual representations of neuronal networks.

Artists and scientists have their own languages to describe the concept of emergence. Do the movement patterns of the dancers, the birds, and the neurons have anything in common? Does a dialogue between artists and scientists have something to contribute to their own communities as well as the culture at large? Yaneer Bar-Yam, in his book *Dynamics of Complex Systems* maintains that "...all scientific endeavor is based, to a greater or lesser degree, on the existence of universality, which manifests itself in diverse ways" (Bar-Yam 1997, 1). Might there be universal principles contained in the concept of emergence that could shed light on structuring principles for many disciplines?

Of course, artists are not molecules. However, unlike molecules, dancers and musicians can relate their subjective experience during the process of emergent complexity. They are aware of what signals are effective in self-organizing structuring processes, and can reflect on multi-level attention spans that participate in these structuring processes. We believe conversations between artists and scientists about emergence are important, and that a general theory, of value across disciplines, may be possible.

Key Concepts

At the center of this project is an interest in higher-order structures in complex systems that reveal themselves in scientific and aesthetic observations. Complex systems dynamics provides a language with which to consider and discuss our experiences and the emergence of new aesthetic forms. Our exploration of these subjects is based upon the following type of pattern unfolding over time:

individuals> self-organization> ensemble> emergence> complex system

This modality is based on the aesthetic idea that important concepts such as agency, movement, embeddedness, memory, topology, and complexity arise in dancers and musicians in an improvisational system. Through a series of

experiments with professional dancers and musicians based on simple rules and constraints, these key concepts were formulated as a result of observations. They are further defined in Attachment C.

Emergent Improvisation and Film: Why It is Important

Both critical feedback from diverse audiences as well as dialogues with artists and scientists suggest that film is a compelling medium in which to express these ideas. To our knowledge, up until now, no film has yet experimented with these structuring principles. Elliot Caplan is a distinguished filmmaker who collaborated with Merce Cunningham and John Cage in the production of major films and recently documented a choreographer's process for American Ballet Theatre. He is the Artistic Director of the Center for the Moving Image at The University at Buffalo. In 1998, he founded Picture Start Films. As revealed in his beautiful, elegant work, "Beach Birds for Camera," he is an especially sensitive and accomplished filmmaker who has a real sensibility for the intricacies of gesture and their relationship to the natural world. To now apply these ideas to the structuring of a film is an exciting challenge.

It is possible through the making of this film to understand more about complex systems dynamics and how that process might apply to filmmaking. Since film is a time-based medium along with music and dance, beginning with initial conditions for the camera and seeing how the complexity builds, can be an important structuring principle in revealing the work. The forms will be embedded within each other, creating a sensual experience as well as an intellectual and a didactic one.

Concluding Note

"The emerging sciences of complexity begin to suggest that the order is not all accidental, that vast veins of spontaneous order lie at hand. Laws of complexity spontaneously generate much of the order of the natural world. It is only then that selection comes into play, further molding and refining...How does selection work on systems that already generate spontaneous order?...Life and its evolution have always depended on the mutual embrace of spontaneous order and selection's crafting of that order. We need to paint a new picture." (Kauffman 1995, 8-9).

It is exactly that "new picture" that we aim to paint with this film.

PROJECT TIMETABLE

BEGINNING IN SPRING 2010

Filming and Research

Elliot Caplan and Susan Sgorbati will convene with twelve dancers for two full-day filming sessions and one week-long summer filming session. A series of experiments in both the Complex Unison form and the Memory Form will be created.

Research will include gathering of information/imagery and creating a database on evolutionary complex systems, emergent improvisation and emergent structuring (definitions of self-organization, emergence and complexity).

One week in California and Canada will be spent interviewing Dr. Gerald Edelman at NSI, Dr. Bruce Weber, recently retired and now in Claremont, California and Dr. Stuart Kauffman at University of Calgary.

Elliot Caplan and Susan Sgorbati will review film experiments to determine how future filming will be structured. New filming techniques will be reviewed and evaluated. Discussions and workshops will be planned to show film experiments at several colleges (Middlebury College, Bennington College and University at Buffalo) for dialogue and feedback from other artists, dancers and scientists.

Filming and Feedback

More filming sessions will occur with dancers based on previous experiments. Film will be completed and edited. Feedback from artists, dancers, scientists, and the Jerome Robbins Foundation will occur. Several workshop showings and discussions will happen at Bennington College, Middlebury College, Williams College, MIT and University of Buffalo. Work on sound score. Programming for venues to show films, production elements for performances, exhibits and panel discussions.

Distribution

Film will be distributed associated with performances, exhibits and panel discussions. There will be a national tour of colleges and universities (see above as well as Sarah Lawrence, Franklin and Marshall College, University of Vermont, Columbia College, and University of Iowa. Showings will occur in scientific venues such as the theater at The Neurosciences Institute in California, New England Complex Systems Institute in Boston, and for scientists at the Department of Biotechnology and Informatics at University of Calgary. Showings will also appear in artistic venues such as the Lincoln Center Performing Arts Library series, and artistic movie houses such as the Williamstown Theater and Film Festival at Images Theater.

Finally, these showings may lead to a publication, a photography exhibit and a series of performances resulting from the research generated by the film process.

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Attachment A: Guiding Questions

Must a living agent, in order to participate in a self-organizing ensemble, be embodied? (Embodied, in this context, implies a tactile, kinesthetic sense of touch and boundary in time and space.)

In order for agents to structure themselves into groups where there is no outside instruction, must movement be central to forming?

Is connection, bonding or coherence among agents that create ensemble structures always connected to pleasure (which might include food, absence of pain, aesthetic beauty, building shelter)? Therefore, are ordering principles necessarily pleasurable?

In order for emergent structures to appear, must all topological levels be acting at once? Topological levels in this case are both local interactions, small group ensemble interactions, and global interactions as well as developmental principles, spatio-temporal principles, and constraints.

Does selection over time refine a structure as well as create new adaptable ones?

Is there a connection between adaptive functionality of a system and aesthetic beauty?

What does the relationship between Edelman's ideas of integration and differentiation and Kauffman's NK models tell us about structuring principles?

How do we measure in a dynamic system the exact point of criticality where the pattern emerges that describes the particular integration structure with the number and movement of the differentiated agents? Can we predict when those patterns will occur for any particular system?

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Attachment B: The Science

While exploring concepts that underlie emergent phenomena with many distinguished scientists including Gerald Edelman, Stuart Kauffman, and Bruce Weber, Susan Sgorbati has developed artistic experiential experiments that aim to amplify and extend our understanding of these issues by way of behavioral and artistic, as well as scientific and mathematical modes of discovery and expression.

Terence Deacon captures the essence of the wonder of emergent structures and behaviors when he says: "Complex dynamical ensembles can spontaneously assume ordered patterns of behavior that are not prefigured in the properties of their component elements or in their interaction patterns" (Deacon 2003,274).

In physical, chemical, and biological systems, self-organizing structures can emerge spontaneously when a given system is held far from equilibrium by flows of energy gradients and when that system has mechanisms for tapping such gradients (Peacocke 1983; Wicken 1987; Casti 1994; Schneider and Sagan 2005). These processes involve an interplay of selective and self-organizing principles from which higher-order structures can emerge by constraining activities at lower levels of organization. (Kauffman 1993, 1995, 2000; Depew and Weber 1995; Weber and Depew 1996; Weber and Deacon 2000; Deacon 2003; Clayton 2004).

Such emergent systems can, under special dynamic circumstances, select activities and/or behaviors that enable them to capture and exploit energy gradients. (Kauffman 2000). In this way, self-organization emerges naturally; indeed, Kauffman believes, this "order for free" is embedded in all evolved organisms. (Kauffman, 1995,71) Crucially, Edelman's fundamental theory, Neuronal Group Selection, accounts for the self organizing characteristics of the human brain by invoking a similar interplay of selective and self-organizational principles that give rise to complex animal behaviors, including consciousness (Edelman 1987; Edelman and Tononi 2000; Weber 2003). In Edelman's model of the emergence of consciousness there is a central role for both complexity and an interactive process he calls reentry that in humans and other animals with complex brains results in coherent neuronal activity in a "dynamic core" (Tononi and Edelman 1998). Consciousness, according to Edelman, is all of a piece, what he calls "the remembered present," that is a continuous, unrelenting reconstruction of the past integrated into the present moment (Edelman, 2004,8)

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Attachment C: Key Concepts

1) **Agency:** Individual dancers and musicians exhibit agency, or in this context the choice to move or to create sound. An essential aspect of this agency is the sensation of being “embodied.” This feeling/cognitive state is based on a solo practice that incorporates a knowledge of a personal mind/body connection (a kinesthetic awareness) and an attention to time, space, and boundary issues. Dancers and musicians who acquire advanced skills that include a diverse repertoire of gesture and sound practice ensemble awareness that develops the ability to simultaneously focus on the particular, the local interactions, and the global patterns around them.

2) **Movement:** In this context, movement is the energy force driving the self-organizing system, creating the individual actions, the local interactions, and the global ensemble patterns. Movement is key as the system would be static without it. The impulse to move, to touch, to form connections as well as to move away from boundaries are essential actions by the performers. All living things inherently express their vitality in movement. Movement is an essential component in any kind of structuring process.

3) **Embeddedness:** The elements of this particular system contain constraints and boundaries in a particular environment. The structuring patterns cannot be deconstructed from their environment. The global behavior is integral to the environment and will alter with any changes in the constraints. Time and space are essential components and will dictate the nature of structuring. For example, the relationship of movement, time and space within particular constraints will either create a coherent dynamic structure, a chaotic structure, or a rigid one that will halt the composition.

4) **Memory:** Structuring is an act of learning by the elements that are building the shape and patterns. Learning involves memory, reconstructing past experience into present thinking and action. This learning is essentially selectional, choosing certain patterns over others. Edelman speaks of “degeneracy” or many different ways, not necessarily structurally identical, by which a particular output occurs (Edelman and Tononi 2000, 86). The ability to recreate patterns to refine structuring processes increasingly depends on degenerate pathways to find more adaptable solutions to build onto forms. The dancers and musicians exhibit this complex system of memory in their building of compositional structures.

5) **Topology:** In this way of structuring, a 'metatopology' occurs where the system has the ability to operate on all levels at once (Sgorbati 2006, 209). Scale and amplification are important. According to Terence Deacon, a topology is "a constitutive fact about the spatial-temporal relationships among component elements and interactions with intrinsic causal consequences" (Deacon 2003, 282). Three levels of interaction exist at once: the local neighbor interaction, the small group ensemble locally, and the global collective behavior. The composing dancers and musicians need to be aware of all levels at once, signaling cues for moving the structure towards critical points of transition resulting in coherent forms.

6) **Complexity:** Dynamic compositional structures among dancers and musicians arise when simple rules are followed through improvisation based on certain constraints in the environment. This leads us to speculate that there are three interactive levels of analysis to these complex structures: systems approach (evolutionary biology), developmental approach (morphology), and psychological approach (meaning) as a way of observing structuring principles (Susan Borden personal communication with Sgorbati, 2006).