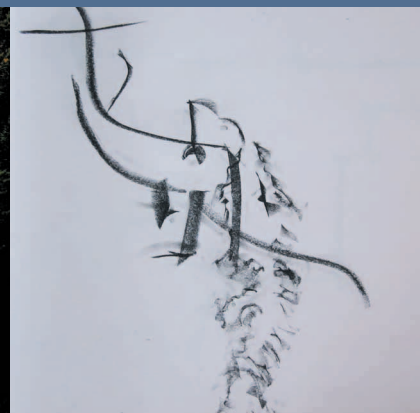


EMERGENT IMPROVISATION

on the nature of spontaneous composition
where dance meets science



by Susan Sgorbati
with Emily Climer & Marie Lynn Haas

Contact Quarterly dance & improvisation journal
chapbook 4 summer/fall 2013 volume 38 no 2

“*I stand on my dock overlooking a clear lake that contains seemingly hundreds of minnows rushing back and forth in an underwater galaxy. The little fish are a large school of perch, perhaps only weeks old. Beneath the reflection of Sun and Cloud on water, they appear to shift and dodge in a dimensional dance of submersion and surface motion. They do not bump into each other and seem to know how to organize themselves gracefully; their movements are quick, intricate, and reflect a remarkable sense of timing in their interactions. They create endless swirling patterns, sustaining a coherence that is striking, with no apparent leader.*

The ensemble of dancers is moving across the space, spontaneously following their own impulses. There is no choreographer directing their movements, and yet there is a pattern appearing that they all seem to recognize and understand. Musicians are creating their own sound patterns in relation to each other and the dancers. How do these patterns arise? What are the signals of communication?

I have a conversation with a scientist from the Neurosciences Institute in La Jolla, California. He shows me illustrations of neurons in the human brain, forming patterns that reflect thoughts and sensory responses. He tells me there is no central command in the brain informing these patterns. Clusters of connected neurons are self-organizing, and their patterns are emergent phenomena.”

Contact Quarterly dance & improvisation journal
www.contactquarterly.com
a vehicle for moving ideas



EMERGENT IMPROVISATION

where dance meets science
on the nature of spontaneous composition

by Susan Sgorbati
with Emily Climer and Marie Lynn Haas

*Drawings by Marie Lynn Haas and Emily Climer
Photography by Terry Gannon, Paul Kyle, Cynthia Locklin,
Jake Meginsky, and Hamilton Poe*

above: Emily Climer [front], Marie
Lynn Haas, and Corina Dalzell.
Photo by Hamilton Poe.
left: Drawing by Marie Lynn Haas

Contact Quarterly chapbook 4 summer/fall 2013 volume 38 no 2

Contact Quarterly, a vehicle for moving ideas since 1975, is a biannual print journal of dance, improvisation, performance, and contemporary movement arts. We also publish online year-round. We exist to encourage articulation and dialogue and to stimulate activity and exploration in the field of movement and its performance.

FRONT AND BACK COVERS:
Photographs by Terry Gannon
Drawings by Emily Climer

Emergent Improvisation © 2013 Susan Sgorbati

CQ/CE publishing project directors:
Lisa Nelson, Nancy Stark Smith
CQ editors: Melinda Buckwalter, Lisa, Nancy

chapbook 4 curator/editor: Lisa Nelson
design: Susan P Huggins
printer: Howard Printing Inc., Brattleboro, VT

CQ operations manager: Walter Clune
office manager: Stephanie Gibbs
products/shipping mgr: Nellie Wilson
editorial/produ. ass't: Aretha Aoki
advertising mgr: Walter Clune
webmasters: Daniel Lepkoff, Craig Harman
CQ/CE Advisory Board: Chris Aiken, Leslie Cohen-Rubury, Sondra Loring, Susan Waltner, Lailye Weidman, Marlene Wong, Elizabeth Zimmer

www.contactquarterly.com

CQ chapbook 4 © 2013 *Contact Quarterly*.
All rights reserved for authors. *CONTACT QUARTERLY* is a project of Contact Collaborations, Inc., a 501(c) (3), nonprofit, tax-exempt organization in New York State and registered in Mass. *CQ* is published by Contact Quarterly, P.O. Box 603, Northampton, MA 01061; tel. (413) 586-1181, fax (413) 586-9055; info@contactquarterly.com (business inquiries); submissions@contactquarterly.com (editorial); cqads@contactquarterly.com (advertising). Street address (no mail): Arts & Industry, 221 Pine St. #112, Florence, MA 01062. All donations are tax-deductible and welcome. Subscription (print or online) and back issue rates are on our website. All payments must be in U.S. funds, drawn on U.S. banks. Credit card payments accepted. Display and classified ads available. Letters, art, and manuscripts are always welcome; we review all our mail for possible publication.

ISSN: 0198-9634



above: Carson Efird, Katie Martin, Zornitsa Stoyanova, and Jaamil Olawale Kosoko. Photo by Jake Meginsky.

Contact Quarterly dance & improvisation journal
chapbook 4 summer/fall 2013 vol. 38 no.2

EMERGENT IMPROVISATION

<i>preface</i> Lisa Nelson	3
Introduction Susan Sgorbati	5
Emergent Improvisation Defined	8
A Meeting Between Dance and Science	11
Talking to Science: a conversation with Bruce Weber	14
Solo Practice	20
Embodiment	
Discovery of Movement Vocabulary	
Attention to Spatial Environment	
Focus on the Particular	
Emergent Structures for the Solo Practice	
Talking to Science: a conversation with Stuart Kauffman	26
Ensemble Practice	33
Assessment/Reflection	
Compositional Exercises	
Compositional Tools	
Emergent Structures	
Communication	
Performance	
Talking to Science: a conversation with Gerald Edelman	40
Emergent Forms	44
Complex Unison Form	
Memory Form	
Recall Form	
Landscape Form	
Reflections on the Practice and Performance of Emergent Improvisation Katie Martin, Jake Meginsky	50
Language of EI	54
Sources	57
Biographies	60

“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 selections’ crafting of that order. We need to paint a new picture.”

(Stuart Kauffman, 1995)

ACKNOWLEDGEMENTS

I wish to thank the scientists who deeply inspired this work with many intense and important dialogues: Gerald Edelman, Stuart Kauffman, Bruce Weber, Anil Seth, John Iverson, and Marco Iacoboni. In equal measure, I thank my students and collaborators on this book, Emily Climer and Marie Lynn Haas, for inspiring me so much with their dancing, their thinking, and their writing. I want to thank Bennington College, especially President Elizabeth Coleman and faculty members Terry Creach and Dana Reitz for their support. I thank the exceptional creators and performers, Penny Campbell, Peter Schmitz, Terry Creach, and Arthur Brooks—my colleagues in the improvisation performance group Giants of Sciants—for teaching me so much. I thank my first dance teacher, Nadia Chilkovsky at The Philadelphia Dance Academy, and artists/ teachers Judith Dunn and Bill Dixon at Bennington College whose focus on the performance of improvisation as composition was deeply embedded in me. My gratitude extends to the cadre of dancers and somatic educators who have contributed essential and substantial knowledge to the field of dance improvisation over the last 40 years, in particular to Steve Paxton and Lisa Nelson, whose Contact Improvisation, Tuning Scores, and work together have brought improvisational performance and thinking to a challenging level.

I want to thank Katie Martin and Jake Meginsky for their research on the original work of Emergent Improvisation; photographer Jonathan Kline for his early participation; Jon Isherwood and Michael Giannitti; the dancers and musicians on the national tour of *The Emergent Improvisation Project*: Nicole Daunic, Carson Efrid, Jaamil Kosoko, Katie Martin, Lionel Popkin, Cori Olinghouse, Zornitsa Stoyanova, Keith Thompson; and the four students who joined us later: Marie, Emily, Lydia Chrisman, and Nikolaus Tsocanos. I thank Elliot Caplan for believing in the work and entering a long-term collaboration to make a film about it. My thanks to Terry Gannon for his beautiful photographs of the dancers and natural imagery and to Sue Huggins for her elegant design of this book. And my enduring thanks to Lisa Nelson, my skilled and gifted editor, and most importantly, my sister in spirit for over forty years of friendship. She encouraged me to publish this book, challenged me to make the ideas clear, and worked with us to bring it to publication.

My gratitude goes to Floria Lasky of The Jerome Robbins Foundation for financial support of the initial research on EI, and to The Flynn Center for the Performing Arts and the Creation Fund of the National Performance Network, the Bumper Foundation, and Bennington College for funding towards the 2005–2006 national tour. I thank the Wyncote Foundation and The Experimental and Media Performing Arts Center at Rensselaer Polytechnic Institute for granting me time to explore new research on “emergent structuring” from multiple perspectives with their first Creative Research Residency in April, 2012.

Emily, Marie, and I wish to thank our families for their love and support. And finally, we thank all of the improvisers who have worked with us for sharing their knowledge and participating in this amazing experience.

PREFACE

This little book invites us to be a fly on the wall of an improvisational dancer’s, by nature, self-invented research. We enter the dance studio during Susan Sgorbati’s process of merging with a science called Emergence, which in itself, and perhaps by its own nature, is still emerging. Both of these fields have been incidentally emerging for a scant forty years.

Susan, I asked, when reading the manuscript, Can you explain this Emergence to me in your own words? Without repeating the syntax of the scientists who’ve offered you this template? Oh yes, she said. And began again, using the same words. Patterns, self-organization, open-ended environment, chaos, order, complexity, constraints, form, structure, selection, adaptation, endless possibilities. Part of any self-respecting improvisor’s core vocabulary, surely.

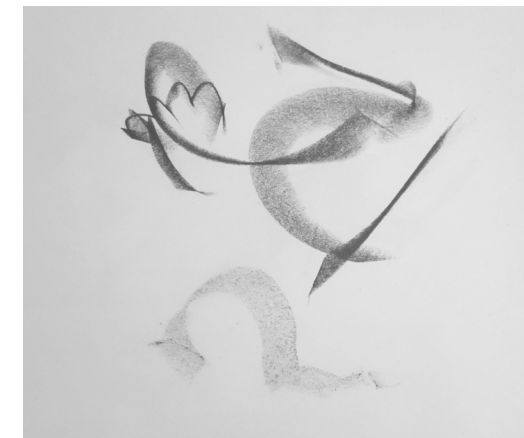
Ten years earlier, I’d had a conversation with Susan about the moment. She was speaking of her deepening curiosity about what she was observing in the dance studio with her improvising students. She wondered, What is the force driving the recurrence

of seemingly spontaneously arising forms of action and relationships in one group of dancers after another? And then, What is the state of attention necessary to pick up on unspoken instructions that make a group action out of a bunch of individuals moving about “freely” in a space? For those of us whose bodies are our medium, where the inside form and the outside form keep a constant patter, these are themselves recurring questions. I nodded.

As you will discover in these pages, Susan went on to embody a science that mirrored her dance’s desire. And so far has made it concrete, so one could interrogate the science through the improvisational dancing and experience the dancing through the science. And vice versa.

What balances the limitations of a dance pedagogy on paper with the valuable ambiguity of human artistic process are the astonishingly frank exchanges between Susan and the eminent scientists who’ve engaged with her and her students in the dance studio and elsewhere. As in the rest of the book, form and content speak to one another.

—Lisa Nelson, *Contact Quarterly* dance journal



Drawing by Marie Lynn Haas.



Dancers: Emily Climer, Marie Lynn Haas, Corina Dalzell, Nikolaus Tsocanos, and Lydia Chrisman. Photo by Terry Gannon.
Drawing by Marie Lynn Haas. Nature Image by Jake Meginsky.

INTRODUCTION *When you look up at the sky and see a migrating flock of geese,
when you are at the ocean and watch hundreds of pipers taking off from the beach,
when you watch a school of minnows under the surface of a lake,
when you watch a herd of deer crossing a landscape or a swarm of bees in your backyard,
you are witnessing a fundamental process of evolutionary design.
This act of self-organization, where there is no continuous leader, no predetermined script,
where ensembles create their own patterns, is what this chapbook invites you to explore.*

Over the last twenty-five years, I have been in the studio with dancers at Bennington College and have taught improvisation to students and professionals in many other places around the country and abroad. The studio has been a laboratory, a place of research. Improvisation itself, as a practice and performance, is not a new concept, and over the last forty years many artists have contributed profoundly to its development. However, my process of discovery had been somewhat isolated in the studio in Vermont and on its own was self-organizing, gathering strength and clarity with each ensemble's interaction and practice of the patterns we were discovering.

It was fascinating to see how the structural elements of improvisation took on more definition with each new group of students during those early years. From the initial intuitive observations of simple patterning, the discussions became more intense and detailed and the structuring more intentional and complex. Over time, we found we could remember more, track more, and understand the development of movement material both individually and in the ensemble. At that same time, I entered the field of conflict resolution through invitations to mediate group conflicts in the greater college community. With this work, I began to feel the deeper implications of group communication. I noticed parallels within the group interactions in the dance studio and social arena that spanned from chaotic to highly ordered. Because mediation involves the disputants themselves structuring agreements from within, another system for self-organization presented itself to me, and began to inform the dance work.

In 2003, when I began a conversation with scientists who were engaged in researching complex systems, I was stunned by the resonance with my work and my research took on a new set of insights and practice. This science of emergence gave me a template for my observations and provided a language with which to consider and discuss our dance experiences and the emergence of new aesthetic forms. Three scientists had particular impact on shifting my perspective. Dr. Bruce Weber, Dr. Gerald Edelman, and Dr. Stuart Kauffman are each visionary thinkers. Their thinking is so vast and so creative that after conversations with each of them I felt I'd been on a space ship ride or taken deep into the ocean.

What I have come to call "Emergent Improvisation" is simply the naming and identification of a process of dance/music improvisation that I have found myself in the midst of unfolding by applying the language and concepts of complex systems dynamics. Improvisation is a process of composing in the moment. By composing, I mean ordering, structuring, organizing. My research and practice seek to develop the skills required to embody and recognize patterns of natural living systems that arise in the present moment.

The implications of the practice of Emergent Improvisation cross disciplines and enter daily life on many levels. On a personal level, it invites an individual to define her or his own potential for expression, to cultivate a vocabulary with which she/he can interact with others, and then negotiate that vocabulary in relationship with the community. On an ensemble level, our experience gives us a basis to question when and in what context emergent complex systems can be more efficient and adaptive than more rigid, hierarchical systems.

Observing these patterns in nature, in dance and music improvisation, and even in public schools and social agencies, I've come to ask whether there are underlying structuring principles that cross the disciplines of art, science, and human culture. How do various systems of organization transform for the purposes of communication?

When my students, Marie Lynn Haas and Emily Climer, and I began to write this chapbook, we looked to refine a language that could articulate the communication processes that occur in our practice. When we first imagined who our audience might be, we thought they will be dancers, particularly improvisers, since movement has been central to our discoveries. But finally, we see it is for anyone interested in a dialogue about improvisational processes and the meaning carried within them, whether scientists, musicians, or city planners. The phenomenon of "emergence," where a new pattern is created because the sum of our interactions is greater than any one of our individual contributions, is an experience we want to share with all who might be interested in this journey.

Observation of a complex system in a self-organizing process, from the individual to the small grouping to the global behavior of the large ensemble, is endlessly intriguing. Each new discovery is a gift. This work continues to teach us, to help us grow and better communicate with each other. There is a profound sense of the aesthetic, the social, the intellectual, the emotional, and the scientific experience within this act of creative improvisation.

This chapbook is an attempt to define Emergent Improvisation as a concept for research and practice, and to describe its origin in relation to conversations with scientists.

We will describe its main components—The Solo Practice and The Ensemble Practice. The Solo Practice has several building blocks that focus on developing a personal movement vocabulary for the individual, preparing them for dancing within a group. The Ensemble Practice begins with compositional tools that are useful for groups of improvisers to recognize patterns embedded in structures that are embedded in larger forms. Four forms are described in detail. We conclude with a glossary and a list of sources for the reader.



Dancers: Katie Martin, Carson Efird, Zornitsa Stoyanova, Jaamil Olawale Kosoko.
Photos by Jake Meginsky.

EMERGENT IMPROVISATION DEFINED

The practice and performance of Emergent Improvisation addresses the nature of improvisation in dance. In the context of emergence, “improvisation” refers to the spontaneous creation of sound and movement by performers who are adapting to internal and external stimuli, impulses, and interactions without an outside director.

The phenomenon of emergence is found in a wide variety of natural settings. New kinds of order emerge, not because they are preconceived or designed, but as products of dynamic, self-organizing systems operating in open-ended environments. Evolution, for example, is now observed to be improvisational and emergent, as is the brain function that lies at the heart of what it is to be human.

Emergent Improvisation explores the way in which natural processes underlie artistic expression along with the possibility that, in turn, art can help illuminate natural processes. In linking the creative work of art-making to the emergent process examined by science, 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. While exploring concepts that underlie emergent phenomena, I developed artistic experiential experiments that aimed to amplify and extend our understanding of these issues.

Over the last nine years, in thinking about the deep connections between ordering principles in nature and within dance and music improvisation, I’ve been asking: What kinds of forms might we look at that would inform both? What kind of experiments could be set up to find these principles? This investigation has resulted in three areas: research, education, and the practice and performance of Emergent Improvisation.

There are three key concepts that link Emergent Improvisation to the science of complex systems: **self-organization**, **emergence**, and **complexity**.

Self-organization is the ordering or structuring that arises within an ensemble of performers without a choreographer or director. The ordering comes from each individual interacting within an open-ended environment.

Emergence is a potential outcome of self-organization and a property of a complex system. It is the phase in the process of interactions where the performers recognize a pattern arising that exposes the potential for something new—a collective behavior that is both different from and more than the sum of its parts.

Complexity is a structuring that arises at the edge of chaos, where there is enough order for an ensemble to recognize and sustain a pattern or system of patterns, yet enough openness to be adaptable to new aspects within the system, which can lead to the creation of a unique variation or new outcome. A complex system has a natural lifespan.

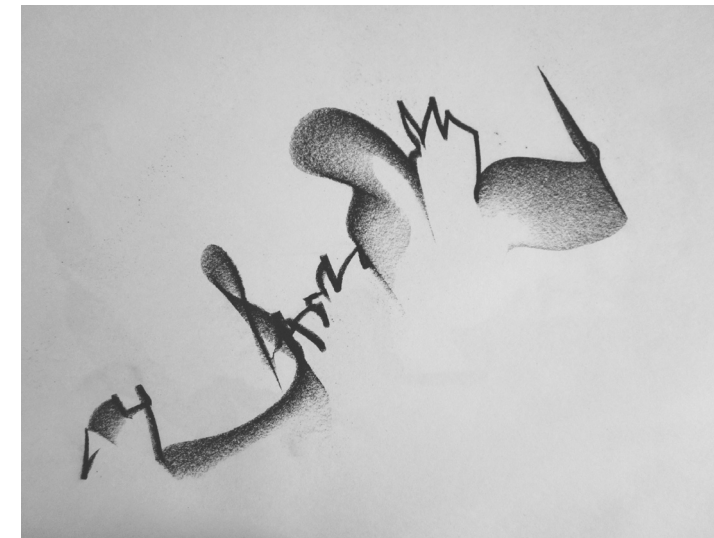
One of the key elements of complexity is what scientist Per Bak named *self-organized criticality*. This term refers to the tendency of large systems with many interacting interdependent components to evolve into a delicately poised state without the direction of an outside agent. This emergent state evolves into a complex dynamic system that can be unpredictable in its outcome. Improvising dancers and musicians report an experience of this state when selecting for coherent patterns in the space of their interactions.

The study of emergence in complex systems explores how the many components of a particular system give rise to a collective behavior. In movement improvisation, I’ve observed complexity in the dynamic compositional structures that arise among dancers and musicians when simple rules or constraints are followed. We’ve sought to construct repeatable developmental constraints that make complexity visible.

In addition to the elements of complex systems, I’ve observed the following factors that contribute to Emergent Improvisation:

1. **Movement** is the energy force driving all self-organizing systems in a directional flow in time. In the case of improvising dancers, movement is the basis of their vocabulary. This vocabulary of action includes gesture, emotional expression, rhythmic timing, and exploration of space.
2. The dancers and musicians in improvisation have **agency**—the personal choice to move, create sound, and interact with the ensemble. Two essential aspects of agency are kinesthetic awareness (the sensation of being embodied) and a desire to interact by mimicking, exchanging, contrasting, and/or developing gestures, rhythms, and energy with others.
3. The self-organizing relationship of movement within a particular time and space, within a particular context or composition—in scientific terms, **embeddedness**—will create a variety of dynamic structures.

4. **Memory** is an essential factor and a complex system in itself. Structuring is an act of learning while building shapes and patterns. Learning involves memory—reconstructing past experience into present thinking and action. This learning is essentially a selection process, choosing certain patterns over others in order to find more adaptable solutions. Dancers and musicians use their complex system of memory to build compositional structures.
5. In EI, three levels of interaction, what I call **topologies**, exist at once: the local neighbor interaction, the small group ensemble, and the global collective behavior. The performers need to be aware of all levels at once, signaling each other in order to transition a structure toward a coherent form.



Drawing by Marie Lynn Haas.



Dancers: Zornitsa Stoyanova, Jaamil Olawale Kosoko, Katie Martin, and Carson Efird.
Photo by Jake Meginsky.

A MEETING BETWEEN DANCE AND SCIENCE

I was already schooled in the Graham and Limon dance techniques when I entered Bennington College in Vermont as a student in the late 1960s. Under the influence of Viola Farber, I quickly became immersed in the Cunningham technique. In my sophomore year, dancer/choreographer Judith Dunn and musician/composer Bill Dixon came to teach improvisation. Judith, a former member of the Merce Cunningham Company, had recently come from the Judson Dance Theater in New York City, a hotbed of the avant-garde in dance. The performance of improvisation was a radical idea at the time. Not that improvisation was radical—it was always a part of dancing. But the idea to take it seriously as a form for performance—that there are skills involved, that it could be practiced, that musicians and dancers were working as equals—was radical for the contemporary dance scene at the time.

Many years later, I returned to Bennington where I continued teaching Judy’s work and began investigating my own interests within dance and music improvisation. For over twenty years now, I’ve been teaching improvisation alongside musicians at Bennington, with world renowned percussionist Milford Graves, the late distinguished musician and composer Bill Dixon, and his student and colleague Arthur Brooks.

Over time, while watching my students improvise, I noticed that certain patterns and forms kept reappearing and I began to give them names—such as *main event/chorus*, *unison*, and *path*. In the early 1990s, I gathered a small group of former students together under the name *Materia Prima* (Paul Matteson, Jonathan Kinzel, Lionel Popkin, Hope Clark and Maureen Ellenhorn). In these early years, we experimented with combining these patterns, or “structures,” as we called them, together for performance. These elements contributed to the overall structuring of the event, but we had yet to discover a unifying direction. This came with later ensembles as we recognized developmental patterns within our practice. By 2000, my observation of how forms arise in a group of improvising dancers had led me to search for the structures underlying their natural recurrence and look for ways of constructing constraints with enough freedom to reveal a previously invisible shared idea.

In 2003, evolutionary biologist Bruce Weber came to teach at Bennington College, and we began a dialogue that introduced me to the world of complex dynamic systems—a paradigm that has emerged as a major discussion in the scientific community over the last forty years. Bruce was the first scientist to come into the dance studio. He immediately recognized a common language and was eager to participate in the research. We agreed that we were not interested in comparing apples to oranges—of course, dancers and musicians are not molecules. He encouraged me to read more, giving me many essays and books, and to think about ways in which the dancers were embodying structural ideas of complexity. We both understood that dancers organizing themselves without the map of a choreographer were affected by their own methods of self-organization. We observed the points of “criticality” where patterns emerged and developed. We witnessed the complex systems they were creating and questioned the similarities and differences with scientific ideas.

From my initial exchange with Dr. Weber, I became interested in why ensembles of individual entities (cells, animals, people) exhibit self-organizing, collective behavior. The fact that this behavior results in a complexity that is highly effective and inherent in the evolution of living things excited me. Does a collective sense of connection create the drive for structuring in a work of art? Or conversely, does the desire for structuring arise from a need for a sense of connection? This questioning led me to conversations with two other visionary scientists. The first was Dr. Gerald Edelman, Nobel Prize Laureate and the founder and Director of The Neurosciences Institute in California where I spent short residencies for three winters, 2004 to 2006. His book *A Universe of Consciousness*, co-authored with Giulio Tononi, greatly influenced my thinking.

Dr. Edelman’s work with complex systems includes a theory of consciousness that is based on two fundamental properties of conscious states: *integration and differentiation*. In my interpretation of Edelman’s work, integration is where the parts have to hold together enough to create a pattern. Differentiation is where the

global pattern is open enough to allow new information to come in, creating the possibility for many different behaviors. These concepts deeply resonated with my observation of improvising ensembles. I questioned whether this complexity was also an amplification of each dancer's and each musician's conscious state.

Another concept of Dr. Edelman's theory that influenced my thinking is *the remembered present*. This concept relates perception to memory, linking the imagined or immediate present experiences with a past history of behavior. While reconstructing the past into the present, memory can appear to be dynamic and emergent, rather than static. This concept helped me identify recurring narrative and gestural patterns in dance improvisations and led me to formulate a developmental structure I call The Memory Form.

The second scientist whose work continues to greatly influence me is Dr. Stuart Kauffman. Considered to be "the Father of Complexity," and winner of the MacArthur Award, Dr. Kauffman is a founding member of the Santa Fe Institute—the leading center for the emerging sciences of complexity. In his books *The Origins of Order* and *Investigations* Dr. Kauffman seeks the principles underlying the construction of adaptive systems, believing that such systems may reside on the edge of chaos—a zone he calls *order for free*. Poised between order and chaos, *order for free* is a result of a finely tuned selection process. When Dr. Kauffman visited Bennington College, he participated in my improvisation ensemble research and inspired me to explore and name The Complex Unison Form.

Dr. Kauffman's latest book, *Reinventing The Sacred*, explores complexity as a result of ceaseless creativity in nature and culture. Systems that are self-organizing are always finding their way into what he calls *the adjacent possible*—the creative potential for something to exist; a space of possibilities; the ability of a system to create something else; to go from an existing space to a new one. This unpredictable creativity takes place within autocatalytic cell structures as well as economies and artistic practices, creating meaning and purpose in nature and culture.

Artists and scientists have their own languages to describe the concept of emergence. Does a dialogue between us have

something to contribute to our own communities as well as the culture at large? In November and December 2011, Stuart Kauffman invited me to one of his cultural *adjacent possibles*, named "The Crazy Salon," at the University of Vermont. The Salon is a meeting of scientists (physicists, biologists, ecologists, mathematicians, computer geeks), engineers, physicians, social scientists, and students (one of which was a law student). I felt privileged as the initial lone artist in this gathering. We were all searching for how the structuring principles of complex systems produce creativity, meaning, and purpose, whether the problem was solving how a lung tissue heals or how an improvisational dance is constructed. It was evident that artists have valuable insights to contribute with their informed, embodied experience of creative processes. Improvisational performers in particular can bring a unique perspective to this research as they are aware of what signals are effective in self-organizing structuring processes and can reflect on the multi-levels of attention that are called for in these processes. Thus it seems that conversations between artists and scientists create a possibility to develop a general theory of emergence across disciplines.

Years ago, I read an essay called "Biology is Just a Dance" in John Brockman's book *The Third Culture* (1995), regarding the ideas of scientist Brian Goodwin. I don't know if I would have used the word "just" in the title, but he raises points that I think are pertinent to pursuing a serious dialogue between disciplines. He describes the spatial and rhythmic processes and structures in time and space that are basic to all organisms. He compares evolution to the creative process in a dance that has no meaning or direction, but is just itself. I do not agree about "no meaning or direction," however he is probably speaking in a scientific linear sense, rather than a metaphorical or symbolic expression of meaning.

This is why improvisational dancers have an important role to play in this conversation. Improvisers are finely attuned to perceptual choices about time and space. They cultivate a sophisticated awareness of sensory information and how it travels through the body. They understand spatial relationships and patterns. They can follow complex polyrhythmic ideas as they amplify through an ensemble. They can track topologies: seeing the global patterns

while understanding their local neighbor relationship. Most importantly, they have an objective view of pattern and meaning superimposed on a subjectively experienced interaction with others; all of this mainly a non-verbal experience that is powerfully intellectual, emotional, and spiritual. Because dance improvisers are conscious and verbal, they can relay their experience of this "biological dance" to others, including scientists. They are cultivating a highly complex form of communication.

A scientist at The Neurosciences Institute, Dr. Anil Seth, posed this question to me: Does adaptive functionality have a direct connection to aesthetic beauty? When many people experience nature, whether looking at a flower, planting a vegetable, observing animal behavior, or photographing a landscape, they have a similar response of awe at the sheer beauty of what is around them. Could this be because of the ordering of the

complexity? Or might it be because of the variety and detail of a species? Is this caused by an unpredictability of a movement, or a surprising combination of factors? Improvisers have a particular way of experiencing surprising combinations, unpredictable developmental patterning, and a deep appreciation of an aesthetic beauty they embody.

I linger on the question of whether there is a connection between the emergence of complex systems and aesthetic beauty. Emergent Improvisation gives me a platform from which to investigate this relationship. I suspect that through an ongoing process of selection, combined with a kind of rigor amongst the dancers and musicians, certain forms emerge that have a structural coherence capable of creating a powerful sense of meaning or order that deeply resonates for us on an aesthetic level.



Dancers: Emily Anderson, Lydia Chrisman, Marie Lynn Haas, Emily Climer, Isabella Hreiljanovic, Theodore Koppel, Ruth Nelson, and Naomi Washer. Photos by Terry Gannon. Drawing by Emily Climer.

TALKING TO SCIENCE – A CONVERSATION WITH BRUCE WEBER

Dr. Bruce Weber is an evolutionary biologist, a Robert H. Woodworth Chair in Science and Natural Philosophy Emeritus at Bennington College, and Professor of Biochemistry Emeritus at California State University Fullerton. Dr. Weber co-authored with me the essay, "How Deep and Broad are the Laws of Emergence" (2008), which I presented at The New England Complex Systems Institute annual conference. We co-taught several classes at Bennington College, including 'The Emergence of the Embodied Mind' and 'Complexity Studies.'

The following are excerpts from an email exchange that took place over several weeks in 2012, after years of conversations and email correspondence. I started the exchange by sending Bruce three questions. He responded to them all at once and I wove further questions into his responses to which he responded once again.

CONVERSATION ONE

SS: Dear Bruce,
Why does embodiment matter to scientists and dancers? How does a holistic view of mind and body, diverting from Cartesian dualism, impact our experience and our ability to interact with others?

BW: Dear Susan,
The idea of embodiment matters to anyone attempting to understand any sort of emergent phenomenon. Although we ultimately wish to understand the underlying principles of emergence we need to study specific examples with particular instantiations. For example, if we wish to understand some aspect of mind as it emerges from patterns of neuronal activity we need to understand not only the synaptic connections within and between parts of the brain and the rest of the body but we need to be able to consider the whole organism moving in an environment and interacting with that environment through perception and action. This is an Aristotelian rather than a Cartesian approach. Even if we could develop a self-conscious computer it would be embodied very differently from a human and I suspect would be a mind that would seem “alien” to our experience.

SS: I completely agree that we need to look at specific examples. However, does that mean that there are no underlying principles of embodiment relating to emergent phenomena? Can we concur that embodiment includes a holistic understanding of mind and body, and that any sort of fragmented, compartmentalized or reductionist way of defining phenomena leaves out the necessity for entities to interact as a whole as well as interaction of the parts? Do you think that dancers, specifically, since they focus on embodiment as experiential and felt, by tracking local and global patterns at the same time, can understand this holistic frame? Does it change our view of what linearity means? Even though we are subject to time going forward, patterns are not set up in the logical, sequential way we sometimes like to think, but by selection, refinement, and local, regional and global interactions intermingling until an emergent form is shaped. Of course, the nature of this complexity is very different and specific to each example or instantiation, as you bring up.

BW: I agree with you that dancers understand in a holistic way, however, I do not see that this changes our notions of linearity and nonlinearity but it does suggest that what dancers are doing is occurring at several different levels simultaneously, which may or may not be so in other instantiations. A mechanism for memory can take many forms. For example, nucleic acids provide the main form of memory in living systems not only in terms of passing on information about metabolism but also its unfolding over time (development). Mutations that provide a selective advantage are retained in higher frequency and thus provide a memory of what has worked in the past in past environments; if the environment is relatively stable over at least the short run then those mutations will be passed along and possibly become the major form. Long-term memory could be encoded in the DNA; for example, by use of comparative sequences of hemoglobin, along with assuming that the neutral mutations act as a molecular clock, it would be possible to deduce a set of sequences that reflect what hemoglobin looked like at some time in the past; if we synthesized that hemoglobin

we could determine its affinity for oxygen and thus have information about the partial pressure of oxygen at earlier times on earth millions of years ago. I believe that your concern about fundamental principles of emergence is given in my response to your second question.

SS: This brings up first what we mean by “memory” in this context. Normally, I think of memory as related to consciousness of some kind. Even if it is muscle memory related to primary consciousness, not higher order consciousness, it is still based on an experiential model of pleasure and pain, or moving towards food or away from predators. But how does DNA have memory? Is repetition a kind of memory, or just a structural pattern that replicates itself? I agree that this does not change notions of linearity or non-linearity, but how do you understand dancers relating to “several different levels simultaneously?” I agree that this is what happens, but I don’t know how to explain it. It is not exactly what we now call “multi-tasking,” which I think assumes an accumulation of tasks happening all at once. As an improviser, I have the experience of focusing on many different things at once, but not as an accumulation of things, but as parts of a whole that need to operate simultaneously: tracking my neighbor, my small group around me and the global pattern in the room, my own movements, how they are forming a pattern with others, the developmental arc of where we are going, my own choices of selecting, or changing course with other material, the sensation of finding form, how long it will last, and when it will dissolve into a transition to another form.

BW: Memory is a persistence of information/structure/process over time. DNA certainly does this over the lifetime of an individual organism as well as over the duration of a lineage over evolutionary time. We think of memory as related to consciousness because this is how we experience it as conscious humans, but the phenomenon is more general than that. The memory of a computer that is encoded in binary patterns is not conscious but it is memory nonetheless and is somewhat similar to the memory of DNA. The

difference is that the memories in DNA are the result of the interplay of self-organization, stochastic processes and selection whereas the memory in a computer has been programmed by human intelligence. I can imagine the day when computers could become autonomous agents and program themselves, of course then I would presume they would exhibit some sort of emergent self-consciousness. With regard to your experience (which is similar to what I experienced during my participating in the experiential exercises in the studio for our class) they are occurring simultaneously at different levels in the conscious mind of the dancer and the way these interact and lead to emergent structures is undoubtedly nonlinear.

CONVERSATION TWO

SS: Do scientists and dancers share an understanding of emergence? Are there structuring principles that cross disciplines? Do entities that are capable of self-organization all find points of criticality where they emerge into a complex system?

BW: Emergence entails the appearance at a higher hierarchical level of new patterns of organized structure and/or phenomena. The history of the cosmos reflects a series of emergences: space/time/matter from the void; stars/galaxies/elements/planets as the Big Bang cooled; living systems from matter/energy; mind from body; culture from mind. Our intuition is that whatever the level and physical instantiation there are basic principles of emergence (which we are still working to understand) that allow novel structures to appear and sometimes to stabilize so as to persist over time and even evolve. There seems to be the need of some type of gradient, matter/ energy/information, constraints on interaction (nonlinear ones seem particularly potent), criticality, self-organizational interactions, followed by interactions that stabilize the new structure/phenomenon; and to persist long term there needs to be some mechanism for memory. When all these elements are present, there is a ratchet that allows the structure(s)

to persist over long periods of time and to have the opportunity to evolve. Often, if not always, it seems that the new structure/-phenomenon is more efficient at reducing the causal gradient and increasing entropy production, though it is still a controversial issue as to whether entropy production is a *sine qua non* of emergence. Not all complex systems will necessarily find their criticality nor even those that do achieve emergent structure will have them persist, depending upon the stability of the causal factors and the relative magnitude of the various parameters and the resilience of the system to perturbations. The stability of the environment is a key factor in such considerations too. We also have to remember that newly emergent entities affect their environment and can change it in crucial ways. For example, the algae that first developed oxygen-producing photosynthesis changed the earth's environment from a reducing atmosphere to one that is oxygen rich and oxidizing and which is lethal to obligate anaerobes, which have had to retreat to special environments that are oxygen depleted.

SS: In some ways, this answers my first question, because it does appear that there are some overriding principles that as you say, "we are still working to understand," but that under the right conditions produce novel structures. I really appreciate your list of factors. I think that they are very well articulated and clear. I'd like to ask you more about your idea of a mechanism for memory. Dr. Edelman talks about memory as "the remembered present," something that is reconstructed or remapped each time from previous embodied mappings. Isn't memory implicit if there is selection? What are things selecting for, if not some sort of instantiated, embedded structure that is being refined? Doesn't memory suggest that we are in time, and that everything has a past? That some pattern or shape is carried forward, even if it is blown apart, there are innate qualities and constraints on phenomena which is what physics teaches us? Is it possible that anything is actually brand new? It appears new, because the complexity is something we have not seen before, and because there are so many possible combinations, there is always something complex that we have not experienced.

BW: The "remembered present" is something else than genetic memory in the sense that the organism associates certain environmental cues with a past event but it is not a memory of the event per se. Yes, we are embedded in time and things do have a past but new things do appear over time emerging out of the structures and processes of the past/present and this is what a theory of emergence would be about. For example, the transition from prebiotic chemistry to the emergence of the first living things was like a phase transition and genuinely new phenomena came into the world with living systems and changed the world.

SS: Okay, this relates to the previous question, and now I understand better what you mean by genetic memory, although I find it extremely interesting that you bring up environmental cues with a past event, because this could mean that the embodied and embedded qualities of DNA signal cues that move it to replicate in time, which for me, parallels structuring principles of memory on many levels. I completely agree with the importance of analyzing specific entities in particular environments, and the instantiation totally determines the detail and specificity of understanding exactly what is going on, however, the more that I have a dialogue with you and Stuart, the more convinced I am that there are structuring principles in nature that are fundamental to creativity and growth in living things. I met a scientist in Stuart's Crazy Salon at the University of Vermont this past fall who is convinced there is no difference between living and non-living things, only the complexity of their make-up. This concept really made me have a headache.

BW: I think we are "on the same page" here. I also would agree that there are fundamental structuring principles in nature that generate creativity in nature (and ultimately in human culture) but although living things are fully natural I do think that there are phenomena that emerge with living systems (or with the human mind) that are not seen in nonliving systems however complex. This is not vitalism, but just reflects how emergence works.

CONVERSATION THREE

SS: When you observed the dancers in the studio, and tried some of the improvisational exercises, what was your experience? What makes our laboratories different? Why did we feel that we could enter a dialogue?

BW: In the dance studio, the component participants are embedded in a system, similar to say molecules in a solution, but the participants can observe their own actions, those of others, and be aware of any emerging aesthetic structures. There is no reason to assume that molecules share this degree of self-awareness. However, the dance studio allows an easily observable "laboratory" in which to observe the role of rules and constraints and their changes on the types of structures that emerge. With no constraint there was chaos. With some constraint there were incipient patterns that emerged. With too much constraint there was structure but no change or development. But with the right amount of constraint there was a critical point at which interesting and aesthetically pleasing structures emerged and developed over time. The dancers are in a system but can observe their motions, those of the other dancers, as well as emerging and evolving large-scale structures. The degree of visual communication as well as self-consciousness and consciousness of others is not the same as the collection of molecules in a Benard cell or a BZ reaction, also the numbers involved [in the dance studio] are very, very much smaller and hence subject to the properties of systems of small numbers. But in the future, as quantum computers are developed that involve small numbers of entangled photons or electrons, the analogy may become more apt. In any event, the dialogue between scientists and dancers is possible because we share an intuition that there are some general principles of emergence that obtain even when the physical embodiment and instantiation is different or very different. The interaction also adds a dimension to the discourse within and between the communities.

SS: Bruce, this is so exciting, to hear a scientist describe this work so well. Your observations resonate exactly with my experience in the studio. This conversation, to me, brings up the idea of "agency." Stuart Kauffman talks to me a lot about this idea. Because he believes the universe is inherently "creative," he questions where agency begins. Does a cell have a certain type of agency? Clearly, not the kind humans have, but it raises some important questions of where agency begins and how much free will exists. I agree that the key difference is that humans can discuss verbally their experience while they are in the midst of a self-organizing process, whereas scientists are observing the phenomenon and drawing conclusions from their interaction with the observation.

BW: I agree with Stuart that the universe is inherently creative and that agency is ubiquitous but takes different forms. Certainly a cell has agency, even a Benard structure has agency of a sort, but of course not the sort of agency that say mammals or humans have. There is a series of emergences with regard to agency too.

SS: Good, this exchange clarifies my understanding of agency. Here is another question. When you talk about emergence, I get the impression that of the many definitions being used these days, there are two meanings that I am sorting out. The first is when you use "emergence" to describe a sequence of developments, such as from prebiotic chemistry to the first living things, or as you just described, the emergence of agency. The second meaning is the phenomenon of emergence in a complex system regarding "the point of criticality" when the system takes shape out of a phase transition. The first meaning, for me, relates to an evolutionary process, or the idea that systems are getting more complex over time. The second seems to be an explanation for phenomena that are happening as part of organic structuring, or in the nature of living things. Maybe the difference is just in scale, how much time, and how many repetitions occur, before BIG emergences occur that shift entire patterns, whereas on a short time scale, the repetitions seem more similar with small variations. Certainly, dance improvisers are more familiar with emergent patterns that appear and dissolve, many times over. I'm beginning to recognize it now in

other systems related to my conflict resolution work. I'm in conversations now with Chris Koliba, who is Director of the Graduate Program in Public Administration at UVM (Stuart introduced us). He is steeped in Complex Systems Dynamics, and I'm beginning to see how "emergent structuring" may be enabled with certain constraints in collaborative problem-solving processes.

BW: I agree with you that there are two senses of emergence being used and that these differ because of the differences in time scales, but I also think that there are similar underlying fundamental principles involved. I think it is most interesting to be thinking about a range of phenomena, such as the emergence of structure in Benard cells or the BZ reaction, emergence of living systems from nonliving

ones, the emergence of mind from brain/body, the emergence of structures and beauty in improvisation, the emergence of novelty in culture and economics, the emergence of justice in conflict resolution, and so forth. As I said before, we are still in the process of developing a general theory of emergence and we need to consider all these examples and levels to seek clues as to the general theory if it proves possible to develop such a theory. Please keep me up to date with your writings but also I will be interested in how your collaborations at UVM develop.

Best wishes in all your endeavors, Bruce



Emily Climer. Photo by Terry Gannon.
Nature Image by Jake Meginsky.
Drawing by Marie Lynn Haas.

“I begin my solo practice today with a body scan. Lying on the floor with my eyes closed, I notice my weight dropping into the floor. I move my attention to the different parts of my body and notice the sensations I am experiencing. I feel the texture of the floor and the coolness of the air on my skin. My attention focuses on the tightness I feel in my hip flexor, so I slowly begin to rotate my leg in a way that helps release the tension. I allow these movements to get larger as the muscles release, and find a momentum from a leg swing that begins to move my whole body. The swinging release I have found becomes central to the vocabulary I find myself in today.”

SOLO PRACTICE The Solo Practice is a dynamic process of exploring movement as a way to build a kinetic philosophy and technical base unique to the individual. It is an open-ended practice of discovery and investigation that is “of the moment.” It focuses on developing a vocabulary that offers a wide range of movement choices to draw upon for expression. The ongoing development of a solo vocabulary allows the dancer to integrate new information and material and continually expand his or her range of possibilities. The emergent context developed by the Solo Practice is a microcosm of building on organic structuring principles with an ensemble.

Solo Practice is a nonlinear, non-hierarchical process involving four experiences:
Embodiment, Development of Movement Vocabulary, Attention to Spatial Environment, and Focus on the Particular.

Embodiment: Sensory Work

Embodiment in EI is a practice of attention that centers you in the present moment of your own physical and sensory reality. The process involves attuning oneself to the innate intelligence and felt experiences of the body through moving from breath, focus, stillness, silence, and subtle movement or sound. We’ve adapted these practices from sources throughout the dance and body-work lexicon, such as Lisa Nelson’s Tuning Score with the senses, Bonnie Bainbridge Cohen’s Body/Mind Centering principles, and texts such as Mabel Todd’s *The Thinking Body*, Deane Juhan’s *Job’s Body*, and Andrea Olsen’s *BodyStories*.

How do I feel in my body? How can I let go of my judgments about how I look? How can I stop thinking about whether a movement is good or bad, and accept that this is just how I feel like moving today? How do I give myself permission to feel pleasure in my movements?

Embodiment practices facilitate remaining present and responsive to the environment in one’s choice-making. Dancers cultivate and maintain an awareness of what is emerging at any given moment. In the ensemble practice this includes recognizing how one’s individual choices affect how the whole composition unfolds. This is fundamental to the experience of *agency* or individual choice within an ensemble.

The following are processes we have identified as helpful in achieving an embodied solo vocabulary. The intention is to become aware or “wake up” the vitality of the whole body before

beginning a more directed or mapped accumulation of gestures and phrases of movement.

Body Scan: A body scan can be done lying on the floor or standing. Beginning with attention to breath, one notices sensation within the body parts—skeleton, muscle, and organs.

Body Mapping: This is a process of touch and focused attention. The intention is to feel and become aware of the volume, depth and length of body parts through self-massage or the touch of a partner, giving a felt sense of one’s own personal geometry.

Proprioception: Building on the body scan and body mapping, proprioception explores the body’s sense of balance and movement through space. One develops an anatomical knowledge through felt experience of one’s structural alignment, vision, weight, spatial location, and perception of one’s physical kinesthetic from where one can extend further into space. The feelings of how much effort it takes to shift one’s weight into a new position, how it feels to turn, and how the body rights itself after a fall are aspects of proprioception.

Tuning: This term comes directly from Lisa Nelson’s Tuning Score practices that approach studying composition and communication from the felt organization of the body within its environment, developing connections of awareness, attention, and action.

Katie Martin. Photo by Jake Meginsky



“In my practice today I find myself moving between a series of fluid turns and sharp quick changes of direction. I play with the duration of each movement and my natural impulse to interrupt one action with its qualitative opposite. The turns are a response to the circular architecture of the space, while my sharp quick gestures emerge from an internal sense of timing. I become especially interested in the timing of how I shift between external and internal modalities, resulting in sensitivity to duration and rhythm. Suddenly my turns become sharper and quicker and are interrupted by moments of unexpected stillness.”

Discovery of Movement Vocabulary

Discovery begins with exploring one’s own movement choices through sensory awareness and memory, noting recurring patterns and spontaneous impulses. You allow your history of all of your training and dancing experiences to be continually rediscovered, reshuffled, and recombined. This endless creative process of discovery infuses the practice of EI.

The investigative process includes:

1. Attention to the issues of **physical technique**: balance, extension, vibration, gesture (turns, falls, jumps), textures, and simple to complex phrasing.
2. Expanding **range of articulation and expression** through the practice of: initiating impulses from different body parts; rhythmic patterns; musicality—phrasing and timing; deconstruction of phrasing—performing the same phrase with changes of level, focus, speed, texture, repetition, and retrograde; body geography—re-shaping the body as a sculptural, three-dimensional form; internal imagery.
3. Exploring **energy states** affecting dynamic levels of intensity while moving.
4. Exploring the **anatomical system of the body fluids** that affect the range of qualities or textures in one’s movement as set forth in the work of Body-Mind Centering. E.g., the grounded quality of moving from cerebrospinal fluid, the high energy aerobic quality of moving from the arterial blood.

Attention to Spatial Environment

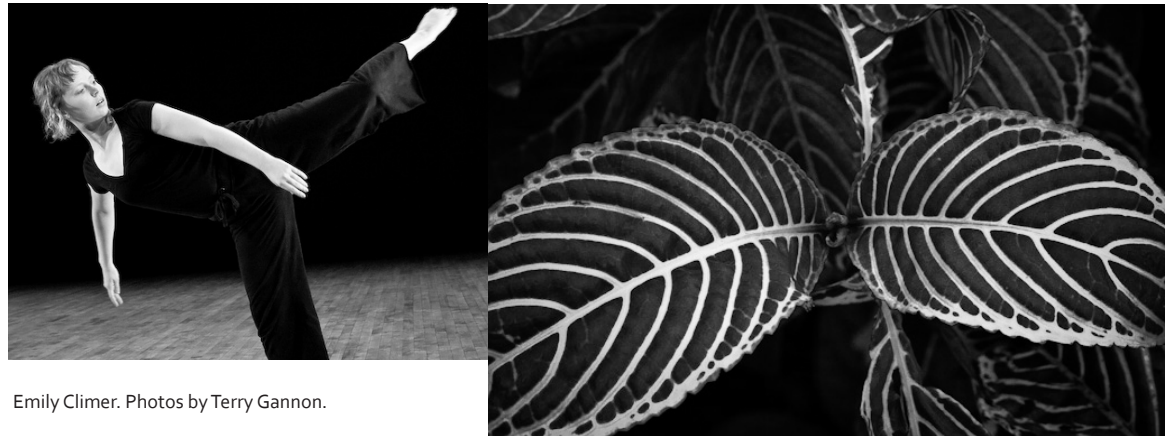
Broadening attention from a focus on my internal compositional relationships to include an external awareness of self within the environment brings an awareness of location. What kind of space am I in? What does it look like? What does it feel like? What does it do to my focus? Can I see far out a window, or observe the patterns on the wall with my touch? I sense other people in the space, and how far or near they are to me. A multidimensional attention brings both an internal and external sense of time and space.

This attention includes: spatial orientation, boundaries, architecture, sound, light, temperature, energy.

Focus on the Particular

The narrowing and selection of particularities of movement for compositional development is an ongoing refining process. It is an exploration of dimensions and scale, edges and range, and depth and scope through various dynamics. A particular choice can lead to various kinds of development, e.g., an exploration of repetition, phrasing, or assembling patterns. It might involve attending to

beginnings and endings of phrase material, exploring narratives and images, or referencing previously articulated gestures or movements. Focusing on the particular helps one be specific and selective in the development of one's movement vocabulary and way of structuring movement patterns.



Emily Climer. Photos by Terry Gannon.

“At this point in my practice, I expand my field of vision to include an awareness of the space around me. I notice where I am in relationship to the light shining through the windows, the lines of the beams crossing the ceiling, and the other soloists in the room. I connect with the surface of the wall by referencing its texture in my movement. My focus shifts and I am drawn to a pool of light illuminating a diagonal pathway across the floor. I travel along the lighted path with a series of quick turns. Maintaining my connection to the light, I scan the room and notice how the smooth, circular shape of my movements contrasts the sharp angular gestures being explored by a dancer nearby. I sense the volume of the space and am aware of the arrhythmic timing of my turns as I play with varying the size of my steps.”

Emergent Structures for the Solo Practice

In the solo practice we define emergent structures as patterns that arise within the exploration of movement phrasing. The soloist builds the capacity to identify and name recurring patterns of development. By repeating these patterns, we find variation and range in movement vocabulary and relationship to the environment. Patterns emerge, morph, dissolve, and shape the development of a composition.

In EI, we have noted that emergent structures need a strong point of origin. Beginnings are key and time is taken to develop and strengthen their definition and clarity. Many structures begin with the spontaneous construction of a movement phrase. It is important to note that in an improvisational dance context, a movement phrase is possible to repeat without the expectation of exactness that choreography may demand. Within EI, the accuracy or variability of phrase material is left up to the improviser. However, the performer is continually challenged to make a coherent structure visible to an outside viewer, an intention that makes the experience of each structure distinct and engaging.

We have identified four recurring structures as particularly useful for the solo practice, which can also apply to the ensemble practice. There are many more to be discovered.

Theme and Variations: This structure is the most enduring compositional form found throughout dance history and is a fundamental design found in nature. Look at any species of plant or animal and find endless variation. In EI, a theme is any coherent focus on phrasing, texture, timing, etc. that can be repeated

clearly. Variations can be as classical as rondos or ABA, or as abstract as three linear gestures that repeat continuously, varying in timing and spatial pattern.

Accumulation: This structure is well known in post-modern dance through the choreography of Trisha Brown. A dancer creates a phrase by sequentially adding one movement at a time to an initial gesture, repeating from the beginning of the phrase after each addition.

Initial Conditions: In scientific theories of chaos and complex systems, *initial conditions* are found to be extremely important in how structures develop from their origins. In movement improvisations, a beginning or origin can be any set of movements composed into a phrase. Once the phrase can be repeated, the improviser focuses on a particular aspect of the phrase: a gesture, a set of movements, a rhythm, or a texture found in the original. Improvised material emanates from that choice, creating new material.

Excavation: Similar to Initial Conditions, this structure begins with a phrase of movement developed by the improviser. Once the phrase can be repeated, attention is directed internally, activating an exploration of subtext or emotional response to what is hidden under the surface of the phrase. Finding an internal sourcing taps into a non-linear developmental arc in improvisation. Excavations can lead to unexpected, unpredictable movement patterns.

“Once inside my solo practice, I find myself exploring a series of balances that take me to the floor. My leg extends backwards and I sink to the ground in a strong lunge. I roll slowly out of the lunge and push off of my arms into another balance.

I notice this is a curious way of shifting my weight and decide to experiment with these balances. I have found my particular interest for my solo practice today. I begin to explore how long I stay in the balance before releasing into the floor. I hold one balance for what feels like ten seconds and move through others without pausing for more than a moment. The duration of my balance affects the timing and quality of how I move to the floor. Sometimes I drop quickly out of the balance, releasing all of my weight instantaneously, other times I melt slowly and direct my weight softly into the floor. My focus on the particular begins to feel like a dance, because it has rhythms, developmental arcs, and resolutions. I am enjoying the discovery.”

Marie Lynn Haas. Photo by Terry Gannon.
Drawing by Emily Climer.



TALKING TO SCIENCE – A CONVERSATION WITH STUART KAUFFMAN

Dr. Stuart Kauffman is a MacArthur award recipient, formerly of the Santa Fe Institute, and founding Director of The Institute for Biocomplexity and Informatics at the University of Calgary in Canada. He holds a distinguished faculty position at the University of Vermont at their Complex Systems Center and is a Finland Distinguished Professor at Tampere University of Technology. In 2004, Dr. Kauffman came to Bennington College to give a lecture and I invited him to observe my work in the dance studio. He jumped right in and experienced the Emergent Improvisation structures. He has a true curiosity and adventurous spirit. From our conversations and my reading of his books The Origins of Order, At Home in the Universe, Investigations, and Reinventing The Sacred, I was inspired to name "The Complex Unison Form." This had been the first improvisational form that I had observed in an ensemble of dancers and it resonated so clearly with Stuart's theory of order for free. This unusual visit with such a distinguished and brilliant person began a profound collaboration that is still current and vital.

The following are excerpts from a transcript of a filmed interview with Stuart and I by filmmaker Elliot Caplan in Burlington, Vermont in 2010. It was filmed for inclusion in the in-progress "Convergence: The Emergent Improvisation Film."

These conversations were casual and extemporaneous—thinking out loud.

SS: I was raised in a dance tradition where there was a choreographer, someone who created the steps for you, and then you did them. Improvisation was kind of considered messing around. So when I had trained dancers in a space and I said, "Randomly, let's just start moving. I'm not a choreographer. I'm not the director. I'm just going to be on the outside observing," what would always happen is that they would find patterns.

SK: You must have had a sense of amazement.

SS: Absolutely. When Bruce Weber introduced me to your work, and I read about your *order for free*, I thought, "I don't know if this has anything to do with the scientific concept, but I do know that I'm in this room where we are randomly moving around and now there are patterns, and there's real pattern recognition."

SK: Would kind of crystallize.

SS: Absolutely. So I would go, "Oh, is this self-organizing criticality? Is this a moment where in this phase transition something actually shifts? Is it a moment of emergence, because a pattern is there that was not there before?" And so that made me really resonate with your ideas, because I thought maybe these structuring principles are deep. Because they are living things... well, clearly you discovered that they exist in living matter...

SK: Well, I discovered that they existed in computer programs.

SS: I mean, I observed it at least in an ensemble of dancers. I observed that it was real.

SK: This takes me to places that I haven't gone, Susan. Is it ok if I try to go there?

SS: Absolutely.

SK: How can we speak language? I had a theory a long time ago that I still like, and it's roughly the following: suppose on one axis I've got the number of sounds I can make, the number of phonemes, the diversity of phonemes. And on the other axis I've

got how well I can mimic these sounds that you make. So now there's a curve in this space, so that if I can't make many sounds and I can't mimic very well, we just do grunts, ok. But if we're out beyond this curve, we get something that crystallizes. Here's your crystallization into language. There's something like the creativity in language in the creativity of the dance, right? There's something much more fluid and open in the dance right? So somehow, when you're dancing, it's not that you're mimicking one another's movements. You are modulating your movements to form a pattern.

SS: When the dancers are doing it, it feels like we have this range of possibilities, and we're modulating the constraints. We're each working within our personal vocabulary and as we meet up with each other, certain tendencies or vocabularies are shared, which then seem to create patterns. And then we would acknowledge the patterns, and then we had a history of patterns...

SK: And a memory of them...

SS: And then we'd start modulating the memory, because there is such a range of possibilities within each pattern.

SK: Look at the words you've had to use, Susan. You're right, of course, and you know it much better than I, but I can imagine it. In Newtonian physics, there are no possibilities. Let me show you. You've got the billiard balls moving on the table with the boundaries of the billiard table, right? And you know the initial positions and the momentum—that's the mass times the velocity of the balls. That's called the *initial conditions*. You know the boundary conditions of the table and you say to Newton, "Now what?" And he says, "Don't be dumb, I've given you these three laws of motion in differential form. Integrate them. I've even invented the differential calculus and the interval calculus. Don't bother me. You go do it." So you integrate the equations of motion. What do you get? You get a deterministic way in which the balls will bounce around the table, right? And a couple of centuries later, LaPlace said, "If there were a vast intelligence that knew all the positions and all the momentum of all the particles in the universe, then knowing Newton's laws, it could compute the entire future and the entire

past of the universe." There are no possibles. It is just the trajectory. It gets even worse with Einstein and general relativity because you have space-time in a four-dimensional block universe, and what are called "World Lines." There is not even a future or a past trajectory anymore. There's just an actual. There are no possibles. You have to get the *notion* of possible in for you to have a range of possibles, so I'm struggling with that part too. But suppose you got it. You're building your past learning, your past knowing. So, like you were talking about dancers from Inner Mongolia and from western Africa and your own colleagues at Bennington, you all have your own vocabularies of motion, and you can both mimic and harmonize with one another, but you do it in a way that only partially repeats. My old state cycles are not adequate for what we're talking about here. There's something much richer that's going on in the crystallization of a dance.

SS: And also it relates for me to your concept of the *adjacent possible*. Will you talk a little bit about that because that feels like an important component of the creative aspect of working with these possibles. In other words: we know that even by re-creating the pattern, it will never be the same; and we know there is enough similarity in the patterns that they're adding up into what we've been calling "structure" which then builds into a form. We're using this kind of language because the levels of organization get larger for the dancers, meaning a form is something that will repeat but has multiple structures in it and the structures have multiple patterns inside of them. So even though they are similar enough that there are rules for them, they move into the *adjacent possible* because they are not the same as the first time they were performed. The detail—all the movement vocabulary—is not the same.

SK: Have you ever heard that something very similar must be happening in great literature and great music? I'm told, I mean I'm not an expert, if you look at the Bible or in Shakespeare, at repetitions of the same phrase, and if you look at the intervals between their occurrences, they show a characteristic distribution in which lots of the intervals are short. So if you look at the intervals, and you plot how many things occur at this interval and then how many with that interval, you get a distribution that goes way, way, way

out that way. It's called a "fat tail." It's a terrible name. Now, transferring this axis into a logarithmic scale, you get a straight line down to the right. It's called a "power law" because a straight line in a log plot says: one thing is something else raised to a power. It turns out that in Shakespeare and in the Bible, there's a power law distribution of the intervals between the repetitions of the phrases. It turns out that in Bach, there is a power law distribution of the intervals between musical phrases. It's even got a name; it's called "pink noise." I'm willing to bet you right now a hundred pokens to your one poken, where a poken will remain undefined [*laughs*]... that if you were to take a movie of you guys doing improvisation and look for the repetitions on something like different scales, I bet you'd find a power law. And that says there is something deep in our aesthetics that finds that beautiful.

SS: A question I have is: Do you think there is a relationship between what you might call *adaptive functionality* and aesthetic beauty? Do you think that we resonate with a kind of order...

SK: But not boredom...

SS: ...an order in complexity that we actually sense as aesthetic beauty.

SK: I hope so.

SS: Yes, I mean I don't know.

SK: Let's try to imagine two extremes. If you just kept doing the same thing when you're improvising dancing, it's dull. Or if you just wander around randomly—chaotic and no beauty. There's something in between. Jackson Pollock's paintings, I'm told, have the property that if you grayscale them so that they're pixels—somebody's done this—and you look to see whether it's a power law, it *is*. Somehow without his knowing what he was doing, he was building rules for himself such that he generated pink noise. What we think we know from the stuff on genetic regulatory nets is that critical networks in some sense have the richest behavior. Now we've got a problem that we don't know how to define "richest." On one side

we have chaos. On the other side is dull repetition. At the edge of chaos, to get this richest behavior, you get something that shows pink noise.

SS: Your use of the words "ceaseless creativity" when you're describing this moment at the edge of chaos...

SK: Let me throw a couple of other things at you, and see how you feel about this. Think of British common law. So it's all done by precedent. I mean, there's no legislature, just judges judging. The ones that are widely cited really influence the law a lot. Like Habeas Corpus, which I found out means, "I'm the judge and you will bring the person to me and I will judge. Bring the body to me." Habeas Corpus is deep in our law. Imagine that you did the following perfectly do-able study: just look at the statistics of precedent citations. There are a lot that are never cited at all, and there's a few that are cited a lot. What if you got a power law distribution? I mean this is a perfectly askable question. What would it mean? So it's a power law. It would mean that there is something deep about humanity that we build a kind of skeleton for ourselves—Habeas Corpus—a framework for ourselves around which we vary. Suppose that's right. But the same thing is true in life. We have *phyla* and then species. I don't know how to think about this but I feel like I almost do. What if what we do—and what if what you do when you dance in the improvisation—is build a framework that's got some kind of deep structure and then you can play within it.

SS: Absolutely.

SK: And it's somehow like the deep structure to a culture in playing with cuisine, like Chinese-Cuban cuisine in New York, or improvisational dance. But don't fiddle around with the deep roots of our culture, because we can only be in a world if we're in a culture. Maybe there's some deep way in which we construct it because it's somehow, I don't know what, but I'd like to think that it's maximizing something, but what?

• • •

SS: I think—and this is from your latest book—your theories about the brain and the mind, and makes sense to me when I think about the dance, that the inclination towards ensemble building may have resonance with how we actually think. Because that is how we have a sense of this dynamic equilibrium in our thinking, in our physicality—in terms of health.

SK: Well yes, in terms of health, but let me ask you about the dance. It doesn't repeat, right?

SS: Right. Well, here is where it gets tricky. Elements repeat...

SK: Right. Elements repeat, but in larger and larger frameworks that repeat ever more rarely until there is a whole.

SS: Well, if we're discovering patterns, I relate it to nature. So we've created an oak tree, but every time you plant the seed of another oak tree, it's not going to be the same oak tree that happened over here. It looks different, even though you still know it's an oak tree. So there are forms that we've created together that can be repeated, but they are never actually the same. The movements are different, but you can call it an oak tree because it's different from the maple tree, which was another form. Now, if we're exploring inside of them, we may come across a brand new pattern. For example, there is this form that I named after your idea *order for free* that I call Complex Unison...

SK: Thank you.

SS: You're welcome... So Complex Unison starts from what I call a "gathering" form, which is simple rules: you can walk, you can stop, and you can change your direction. So those always produce what I call "gathering" even though the patterns will be different every time. From gathering, they will start adding other movements that create unison patterns that start to create landscapes in the space, which means certain pathways occur, certain movements repeat themselves and the dancers can recognize similarities. Again, there is this space of possibilities.

SK: Yes, but what do you mean by landscapes?

SS: Landscapes are spatial patterns. They usually have to do with foreground and background. So there are elements that always appear so that we would call it a "landscape" as opposed to something else.

SK: Could you find the same things in a Jackson Pollock painting?

SS: Well that's a good question.

• • •

SK: And there's something else that's really beautiful: a trans-Turing system, when it goes back to being quantum. If quantum is the possible, it's not deterministic. The universe opens up with possibilities for that system, right? Not like Newton with the billiard balls. Can you feel it?

SS: Yes.

SK: It suggests that the mind, and in particular the human mind, is the locus of the most open creativity in our chunk of the universe. The universe flashes open with possibilities, and that's *the adjacent possible*—but it's ontologically real. I'm in love with the whole thing. I'm just in love with it. Do I know that it's right? Of course not.

How could I possibly know that it's right? I couldn't. But it ties in to what you are doing too.

SS: Absolutely. And that's why I say it resonates so well with an experiential process like I'm in. That's all I understand. Because I feel like all those components are happening when the dancers are creating the ensemble work.

SK: I now have fifty pages of me struggling with a bunch of these issues. I don't know what this is that I'm trying to invent. I don't know what the "it" is that I'm trying to invent any more than you know what the dance is that you're trying to invent. And that's why I think—not to be purple about it—that we're missing our deep humanity. I think our deep humanity is in this. This is why I think the sciences and the arts have to come together with everything else. I don't think our culture serves our humanity. I think we need a spiritual rebirth.

SS: Absolutely. And I also think there's an enormous connection to pleasure with this experience. That there is something so satisfying about a deep understanding of this ability to go into possibilities, and particularly in connection with other people. Because that is really the key—the ensemble.

SK: This is your dancers' cry.

SS: The ensemble—this is the sum is greater than its parts, which is another reflection of it. Right? If it's actually occurring in complexity in nature. When human beings form those kinds of connections, they create stronger bonds than if they were just lining up as individuals. There's something about coming together...

SK: We make it together.

SS: That's right.

SK: Right. And somehow or another I feel—don't you feel something like that? There's something about these enabling constraints in which we build the worlds we build together.

SS: I think we want to build structures together. We have a deep need to build structure. And the question is... Well, you're answering "Why do we do it?" and I'm curious about *how* we do it, in terms of watching it or observing it.

SK: Well, you know aesthetics gets treated by scientists as if it's silly. Somehow it's not silly at all.

SS: No, because in your explanation, it's just different perspectives. You see, this is where I feel like this is so radical. It finally unites these things. Sciences have one way of thinking about things, and aesthetics or arts have another. If both are based on structuring principles that are some reflection of humanity or the deepest part of ourselves, if we were to understand some of what these structuring principles are, then we are really united.

SK: You're doing it when your dance group dances.

SS: Right. I feel like I get a sense of what it means to want to build structures. And I want to know the difference when the structures are either too chaotic or too ordered, because then we don't really want to connect. In fact, we can't connect. If they're too chaotic, we're all over the place. And if we're too ordered, nobody can move. We have no way to go into the *adjacent possible*. We have no way to be able to create something else.

SK: Wouldn't that be neat if someone could really figure out what that means? It sounds right. You know there's a term in Italian in a soccer game for the position on the field that has the greatest *adjacent possible*. It's a very valued position. My knowledge of soccer isn't good enough, but it's basically that you have the most flexibility. I was trying to study it in chess, but I didn't know what to look for, but there's something there.



Dancers: Emily Climer [front left], Lydia Chrisman, Corina Dalzell. Photo by Terry Gannon.
Nature Image by Jake Meginsky.

[left] Dancers: Katie Martin, Zornitsa Stoyanova, Jaamil Olawale Kosoko. Photos by Jake Meginsky.



“I am a beginner improviser and I find myself in a space with ten dancers moving back and forth along a diagonal pathway. I have a hard time concentrating on what I will do, but I focus on my breath, and it allows a sensation of calm to come over me so that I can look around. I notice that everyone on the diagonal has an arm raised, so I try that too. There is something satisfying about joining them, although once I am on the diagonal, I forget that I am in a line and concentrate instead on the dancer next to me, who has made eye contact. We begin an arm exchange of long sweeping movements, and I begin to see that some dancers have dropped out of the diagonal and are moving downstage. I begin to understand that I have to concentrate on many things at once: what movement choices I want to do, where I am, who is around me, and what patterns are we making. This is really exciting, and a challenge.”

ENSEMBLE PRACTICE In the ensemble practice, dancers compose with one another. This is a complex system in which the dancers’ personal movement vocabularies are embedded within compositional patterns or *structures*, and emergent structures are embedded within larger organizational patterns that we are calling *forms*.

While making choices in the present moment, an improviser attends to multi-levels of organization: local, regional, and global, while focusing on movement patterns, spatial relationships, signals from the other performers, and development over time. With an articulate solo movement vocabulary, a dancer is able to bring ideas into quick-moving windows of opportunity in ensemble improvisations. The ensemble engages in a constant selection and refinement of material while, in a process of trial and error, they focus on the emergence of the material and how it is being shaped.

Signaling techniques are essential tools for non-verbal feedback while selecting and developing patterns during the improvisation. They develop amongst the performers and support global, collective, self-organizing behavior that mirrors the *selection and pruning* process that occurs in complex systems in nature. For examples, the focus and direction of the eyes can indicate connection and location of attention in space. Dynamics and speed of gesture, as well as touch, can signal rhythm, tone, and timing.

Assessment / Reflection

Assessment is integral to the ensemble work and embedded in our practice. Verbal discussion develops a collective history, heightening the ability of the ensemble to adapt its choices in the development of a composition. Individuals directly share their perceptions and experiences in tracking the memory of how a structure occurred and point to choices that felt particularly effective or ineffective in the unfolding of a form. In this phase, the work can be critiqued, technical skills advanced, structures and forms identified and developed.

We’ve explored three approaches to observing structuring principles in improvisation; the **systems approach**, the **developmental approach**, and the **psychological approach**. Each approach acts as a lens for viewing and discussion.

To experience improvisation through the lens of the **systems approach** (with parallels in evolutionary biology), we observe how the dancers continually adapt to new movement material, form relationships that result in patterns, and integrate new structures as they arise.

To experience improvisation through the lens of the **developmental approach** (with parallels in morphology), we observe how the movement patterns emerge and dissolve over time, and how individuals and the ensemble create structural variations by building on the initial material.

Experiencing improvisation through the lens of the **psychological approach** involves consideration of the arising of meaning or metaphor as a significant aspect of the complexity of ensemble composition.

Like organic structures in Nature, the ensemble practice does not have a preconceived aesthetic. It can incorporate any and many movement languages. An aesthetic arises out of the negotiation between improvisers—a consensus of movement material and verbal opinions—as the group builds a history of shared experience.

How does the ensemble form judgments about whether a structure works or not? Most importantly, a collective decision arises as much from choices made during the improvisation as from reflections made verbally afterward. We have observed two overall desires implicit in the improvisers’ experience. One is for coherence. The other is for a structure to have enough order to make recognizable patterns and enough openness to allow new or unpredictable possibilities to arise. These desires are notably represented in the science of complexity in the principles of *order for free*—a result of continual selection within the zone between order and chaos, and *integration and differentiation*—a balance between order and openness.

While this balance appears naturally in organic systems that can benefit from a time scale of many years to select, adapt, and refine their structures, in the short time context of a human dance improvisation, this relationship is often elusive and difficult to attain. Too many available choices make it difficult to create

Compositional Exercises for Entering an Ensemble Practice

Broadening from Solo to Ensemble Awareness: *Starting with a solo practice, the transition to working in an ensemble can begin with bringing your sensorial attention to the dancers immediately surrounding you and then gradually expanding your attention to include an awareness of the whole space. We facilitate this expanding attention by forming duets, merging duets into quartets, then quartets into small ensembles until all of the dancers in the space are part of a single ensemble. This provides the practice of tracking at local, regional, and global levels in the development of a composition.*

Duets: *The Duet form focuses on bringing Solo practice into listening, responding, and developing a composition with another. The structure begins with each dancer creating a movement phrase of her/his own. Then the two come together and, without discussion, begin to mimic and trade each other's material, making spontaneous choices about who is leading and who is following, noticing the shared patterns that arise out of the activity.*

As each dancer incorporates into their own phrase select gestures, rhythms and textures of the other's in a continuous exchange, their vocabularies mingle until a third shared phrase emerges which they can perform together.

Ensemble Worlds: *(One can name this exercise after the soloist who begins the composition, e.g. Susan's World)*

This exercise gives an ensemble an opportunity to explore how they can build distinct compositional worlds by listening, supporting, embodying, and responding to the choices of a soloist. It gives a soloist practice in making clear movement choices. The focus is on establishing a shared world.

recognizable patterns, while too rigid a structure does not allow new possibilities to arise. Our challenge is to discover structuring principles that can be repeated with enough freedom to create new emergent possibilities.

The first dancer initiates solo material. Ensemble members then enter to join the soloist, selecting particular qualities, gestures, contrasts, or phrasings that seem central to the movement that the soloist is creating.

The initial soloist can enter or exit the dance throughout the exercise, and also calls the end of the exercise once he or she feels the world has been clearly established.

Initiator, Responder, and Framer: *A dancer initiates solo material. A second dancer then joins and responds by, e.g., taking on similar qualities, gestures, and phrasing, or contrasting the material. A third dancer then enters to frame the duet. Framing involves directing the focus towards the duet by various means: e.g., anchoring the space through stillness, echoing a gesture, creating a boundary through a repetitive spatial pattern.*

The exercise gives a chance to explore possibilities of three different compositional perspectives. Its clear constraints regarding roles give a range of experiences to draw on when roles are non-verbally negotiated within a larger ensemble.

Compositional Tools

Compositional tools are practices that enable the individual dancer and the ensemble to build and recognize complex structures, which in turn enable them to build and recognize more encompassing complex forms.

Tools for establishing basic patterns and relationships within movement material include: **Unison, Spatial Patterns, Solo/Chorus, Retrograde, Rhythmic Patterns, Narratives/Images, Foreground/Background, Repetition, Interruptions, Sudden Changes, Entrances/Exits, Stillness, Shadowing, Partnering, Framing.**

Referencing brings back or repeats an earlier compositional choice in order to emphasize or contextualize its meaning. A dancer can reference a gesture, quality, spatial pattern, or narrative. The ensemble can also reference patterns that have previously emerged within a composition.

Amplification occurs when a movement is made by one dancer and is subsequently mimicked by several dancers throughout the space. It often serves to visually multiply a gesture and quickly establish an ensemble pattern.

Nesting is the practice of shifting attention between the local, small group, and whole space until one is able to sustain awareness on all at once. We also call this a *topology*—the spatial-temporal relationship among elements and their interactions—where the improviser is tracking and mapping this information at all levels simultaneously.



Dancers: Corina Dallzell, Lydia Chrisman, Nikolaus Tsocanos, Marie Lynn Haas, Emily Climer.
Photo by Terry Gannon.
Drawing by Marie Lynn Haas.



“On the periphery of the composition, I observe a dancer enter the space and begin to develop solo material that references pedestrian gestures. I notice her repeat a series of quick, sharp hand gestures, and I enter to frame the development of her solo with this repeated gesture. As I enter, I make eye contact with three other observers, who enter quickly after and join me in chorusing the solo. We begin to expand on the initial hand gestures. These develop into full body movements, causing our chorus to encompass the soloist. We enter a more chaotic structure of five coexisting solos sweeping the space. In this transitional space, the movement of another dancer catches my attention and I begin to unison his material. Once the other dancers recognize this unison as the focal point, their movement begins to dissipate as they move towards the periphery of the space and exit. Left behind is a near-unison duet of slowly shifting sculptural forms.”

Emergent Structures

In the ensemble practice, we define a “structure” as a set of patterns in an interactive relationship. Space, time, and movement are elements of these relationships. Structures emerge, morph, dissolve, and shape the development of the composition. A structure can appear within a larger form or emerge into or become a form in itself, depending on its complexity and the scale of its developmental arc.

The following structures have repeatedly occurred in our practice:

Wash: A pattern where the ensemble crosses the space together at an even energy and speed, allowing individual dancers to drop out when they wish and drop back in on a subsequent crossing. Variations occur when the dropouts improvise movement phrases, or interact with each other from across the space.

Charge: A Charge is a group impulse. It usually has high energy and speed, e.g., a mass movement across the space.

Main Event/Chorus: This pattern is very common in EI. The activity in space becomes more ordered as attractors set up a “hot spot” or main event, where the focus of the complex pattern resides. Like a Greek chorus, the others comment, respond, frame, react, or otherwise relate to the performers in the Main Event.

Waves and Eddies: A pattern where the ensemble travels together forwards and backwards through space, using unison movement patterns with constantly varying energy. Often originating on a long diagonal, smaller ensembles separate out from the wave like shells suspended in eddies.

Pathways appear in various ways. They can be structured through travelling geometrically through space, through focusing attention or gesture along a trajectory, or by standing in a group configuration.

Landscape is a global pattern and appears when the visual rhythms and textures of the ensemble movement create a set of spatial relationships that fill the whole space, recalling attributes of a natural landscape. Relationships include symmetry or asymmetry, foreground/background, varying levels in space, stillness and moving.

Field is a type of landscape that involves a scattering of dancers throughout the space. Just as fields of daisies, wheat, or evergreens have different characteristics, an ensemble of performers can create a variety of fields with different textures, speeds, and levels of energy. Fields give a sense of critical mass to the space.

Tableau is a structure that develops visual imagery. An image can be abstract, relating to lines and geometry, or relate to specific content contained in a narrative. Dancers can build a tableau by accumulation or spontaneously all together. Tableaux contain their own logic, sometimes task-oriented, sometimes surreal. Some appear as still poses, and others are in motion.

Glacial Erratic: A structure in which a large ensemble, in their travel, leaves behind a small ensemble that further articulates the large group material and resolves the composition.

opposite: Carson Efird, Zornitsa Stoyanova, Jaamil Ollawale Kosoko, Nicole Daunic, Katie Martin, and Keith Thompson in *The Emergent Improvisation Project* at The Neurosciences Institute, La Jolla, California, 2006.

Communication

Communication—the exchange of meaning—within a dance ensemble, relies on awareness and responsiveness to the choice-making of others. While many individual skills contribute to an ensemble’s ability to self-organize, several have emerged as central to this work:

Pattern recognition is the ability to recognize patterns as they emerge within the development of a composition. Patterns can appear on many levels, including physical—textures, geometries, or spatial patterns, energetic, metaphorical, or narrative.

Negotiation of roles occurs within the composition with full attention to the range of relational possibilities.

Listening is amplifying and supporting the choices of others. This does not always mean agreement (one can make choices for opposing textures or juxtaposed timings, etc.), but it asks for an awareness of relational possibilities and shared responsibility for compositional development. It is important to consider that listening can involve many senses, including but not limited to aural, visual, and kinesthetic modalities.

Tracking is the ability to simultaneously track at the local, regional, and global levels of the composition, in any given moment, enabling complex local interactions without losing recognizable pattern formation of the whole.

Attention to development is the ability to track the development of the composition over time and contributes to the collective decisions in selecting and adapting patterns in the unfolding of a form. Attention to development builds on the skill of tracking and is strengthened by familiarity with developmental arcs and time-based compositional skills (referencing, retrograding, accumulating, etc.).

Balancing Individual and Collective Choice-Making is a self-regulating system where the dance ensemble requires feedback to enable continual adaptation of patterns in the development of a composition. Feedback occurs in the looping process of initiating and responding by individuals and the group.

Because development is dependent on the emergence of an ensemble consciousness, the relationship between individual agency and ensemble is a crucial and delicate balance. Agency is highly valued, as the contributions of individuals enable ensemble forms to develop with a rich unpredictability. In turn, individual agency is strengthened through the process of co-creating, as the support of others can expand one’s perception and range in choice-making.

Working through states of transition from one pattern to the next is an essential phase in self-organizing systems. It is here where the value of co-creation overcomes conflict between the individual and the ensemble. If improvisers cannot collaborate in making decisions in the transitional spaces and do not recognize patterns forming collectively, the system cannot self-organize. For this reason, a significant aspect of agency is the willingness of an individual to participate in the process of co-creation.

The capacity for communication is central to emergent structuring processes. We recognize that this form of communication in improvisation has implications for other contexts such as governance design, business, and conflict resolution.

Performance

The performance of Emergent Improvisation adds a dimension to engaging in the complexities of ensemble communication. New considerations arise to make apparent to an outside viewer how a group of distinct individuals collectively create meaning. This places value on exposing communication and decision-making processes within the group. To communicate with coherence to an audience has required an extra attention to pacing of development and clarity of beginnings and initial material of each form.

Questions that arise in the performance of EI are: What responsibility does the performer have to the observer? Where is the line between the inherent exploratory nature of this work and the commitment to communicate with an audience? What value are we placing on selection of movement, relational possibilities, developmental arcs, narrative content, virtuosic dancing, and conveyance of meaning?

Ensemble Practice Conversation

EMILY: That was particularly successful, when Niko and Cori were framing the other dancers... There was a lot of stillness in the beginning, and that gave time for us to see what was unfolding.

SUSAN: Do you think this balance between stillness and action is essential in order for us to register coherence? Do we need to see this balance? Does it create the structure?

EMILY: Yes, at times I could feel that my choices were not essential and therefore more chaotic. Not that chaotic is wrong, but they weren’t consciously chaotic. It’s the lack of attention to the ensemble that is the problem.

MARIE: I can really understand and feel the different types of listening going on... You can tell when it is a kinesthetic listening as opposed to a visual listening.

EMILY: The listening is important to building the relationships between us. How do I understand that? We seem to be developing a language that we all understand, and then can recognize the patterns we are developing.

MARIE: But the transitions get muddy sometimes.

SUSAN: That’s true, the transitions are really visible, but become satisfying for me because you know the pattern will be emerging shortly...

MARIE: I also think the transitions contain an aesthetic value. I get interested in this “in-between” phase. But I am also satisfied by the resolution.

SUSAN: Back to determining “what works or not,” is this the right language for assessing this practice?

EMILY: I think what works is based on a kind of adaptive functionality of the ensemble developing and negotiating the patterns together. This kind of conversation helps us figure it out afterwards.



Susan Sgorbati and Katie Martin [in front].
Photo by Cynthia Locklin.

MARIE: I recall when I first started this practice. I could hardly remember anything that happened afterwards, now I can practically remember everything.

SUSAN: It is amazing how much you learn inside the practice as well, the action of improvising in this way. As a teacher, few words need to be spoken when I am in an ensemble practice with my students. They learn most everything by just doing it with me, observing, and having to make choices with me. It is such an interesting and profound way to teach and learn at the same time. It reminds me of Stuart Kauffman’s concept “order for free,” the ensemble making particular choices that emerge into collective patterns without a set score.

EMILY: Yes, the more advanced we become, the more refined selection goes on, the more complex the patterns become... beautiful!

MARIE: Yes, beautiful.

TALKING TO SCIENCE—A CONVERSATION WITH GERALD EDELMAN

Dr. Gerald Edelman is the founder of the Neurosciences Research Foundation and the Director of The Neuroscience Institute in La Jolla, California. Dr. Edelman received the Nobel Prize for Medicine in 1992. I was fortunate enough to be invited to be in residence during the three winters of 2004-2006. Besides the spectacular beauty of the architecture of The Neurosciences Institute in La Jolla, I was able to have many conversations with Dr. Edelman during my time there. I also had wonderful dialogues with Dr. Anil Seth and Dr. John Iverson. A year later, Dr. Edelman invited my ensemble of dancers and musicians, The Emergent Improvisation Project, to perform in a theater on the campus of the Institute. The ensuing dialogue with

November 15, 2012

Dear Susan,

I am responding to your request for my thoughts on possible relations between evolution, brain function, and improvisation. It is important at the onset to preface my remarks with the warning that they reflect an extended metaphor, not a scientific conclusion.

I take improvisation to be the initiation or composing of acts (in your case, dances) with little or no preparation. I presume that innovation in dance amounts to the spontaneous creation of movements. Presumably, this means freeing your body from habitual dance patterns.

Notice that my metaphorical comparison is made complicated by the fact that the brain is responsible for both rehearsed patterns and improvisations. The work of Dr. Charles Limb at Johns Hopkins University indicates that planned actions are accompanied by slowing down of parts of the brain called the dorsolateral prefrontal cortex. Self-expression (presumably in improvisation) is accompanied by increased activity of the medial prefrontal cortex.

With all this agreed upon I am ready to reflect on some biological facts and theories as they might relate to improvisation. First of all, we must recognize Darwin's theory of natural selection. It states that variation in members of a species provides a basis for

scientists, artists and the general public of San Diego was profound and contributed to the ongoing research. Dr. Edelman who is an accomplished violinist, and might have had an artistic career as well as a scientific one, was extremely perceptive in his feedback on the emergent forms in our improvisation work. He was generous and encouraging in his responses. Because of his insights, I named a subsequent form "The Memory Form," after his theory of the remembered present. I felt that Dr. Edelman's critical eye went to the very heart of the work, and just as if I had been in a laboratory with him, I felt the benefit of his enormous intelligence and expertise.

selection of those individual variants who are more fit to survive in the environment. Their progeny survive while the less fit die off. Variation and selection is sometimes called the Darwinian two-step!

Clearly, improvisation by the dancer involves variation and presumably also selection on this variation that must take place at some level or other.

The fundamentals of the far reaching Darwinian concept inform my global brain theory, (the theory of neuronal group selection), also known as Neural Darwinism. I am glad that you found the theory stimulating. It states that, in development and function of the brain, variation plays a key role. Instead of Darwinian selection occurring in a population over millions of years, selection occurs among the neural circuits of the brain which are variable in one's lifetime. Those circuits that favor value or reward for an act are selected by increases in their connection strengths. These increases occur at so-called synapses, regions of connection between one neuron and another.

Undoubtedly there will be an expected difference in the synaptic strengths in the brain of a dancer following a rehearsed pattern and that brain as it is involved in deliberately indulging in improvisation. So if there is a metaphorical link it is provided by the notion of selection and variation.

One can speculate further and ask a whole lot of provocative

questions. I shall give one example here. Are dreams not improvisations? Or is improvisation related to dreams? At this point I shall stop, constrained by the constraints of scientific practice and unwilling to indulge in further improvisation.

Yours ever, Gerry

A Conversation

Excerpts from a conversation that took place September 16, 2012.

SS: Why do we talk about the brain as an improvisational system?

DR. E.: There are a number of factors that favor considering the brain as an improvisational system.

The first is that there is no evidence of a central executive in the brain, no homunculus, no conductor, no choreographer, no one in charge. Nor is there a genetic program, or a score, or an individual's equivalent of software telling the brain what to do beforehand, how to respond to the world. The brain can't know everything it needs to know ahead of time, nor even how to discover all it needs to know before the fact. This means the brain can't be programmed, prior to responding to a given set of circumstances, no matter how elaborate the instructions. Indeed, the conventional computer metaphor for the brain is deeply misleading. Brains are emphatically not biological hardware instructed by biological equivalents of software. Rather, they work by selection and variation and by planning called on the basis of past experience.

SS: What does it mean to improvise in a particular environment? Dancers have the experience of responding to stimuli from other dancers and signals from their sensory perceptions. What is the brain inside each of us responding to?

DR. E.: It is critical to remember that the brain doesn't exist or operate in isolation. The brain is embodied and that body is embedded in the environment. Therefore, a related reason that the brain must improvise is that—like other non-instructed systems such as evolution, the immune system, a jazz band, or a troupe of improvisational dancers—the brain's most significant challenge is that it must operate in a complex, open-ended environment teeming with novelty, unanticipated events and circumstances.

In biology, the alternative to an instructional system is a system based on selection. The most famous of these is, of course, Darwin's magnificent theory of the origin of species by natural selection—or evolution. But we have discovered that the immune system also operates by selection, not by using only the genetic mechanisms of evolution over eons of time to adapt to novelty. Instead it uses analogous biological mechanisms for selection and amplifying effective variations in a population of antibodies that adapt to novel antigens over somatic time, the lifetime of the organism.

SS: Dancers are deeply aware that movement creates meaning in our consciousness. It is full of emotional expression and sensation, even if it can't be verbalized. Movement seems to be an essential component in any structuring process. All living things inherently express their vitality in movement and movement seems to fuel their morphogenesis. Why is movement so important to understand as a contributor to brain function and development?

DR. E.: There are many reasons that movement is fundamental to an organism's development and survival. In the case of the organism's brain and mind, it is crucial to remember as I have said, that the brain is embodied and the body is embedded in the world. In general, perception both depends on and leads to action. Movement is the way that the brain and body sample the environment. It is through movement that the brain is stimulated to interpret and adapt to both the internal and external world, and thereby to learn and thrive. The dynamic structure of the brain is maintained, refreshed, and altered by continual motor activity and rehearsal. And some of that motor activity may be called improvisational.

SS: Another capacity of dance improvisers relates to embodiment or the mapping of gestural, rhythmic and dynamic information in the body by experimenting with movement gestures and shapes. There are many, many ways to jump, to lift an arm and to turn on one leg. Each of these variations on the same shape instantiated in the body can create a memory of learned responses that can emerge in the future without a script. This allows endless variation

on similar movements, preventing repetitive injury while exploring an aesthetic functionality. Does your theory of *degeneracy* that goes beyond redundancy in the neuronal mapping in the brain relate to this ability in dance improvisation?

DR. E.: The meaning of degeneracy in the context of biology is that it is possible to generate the same performance or outcome in different ways. Like selection, degeneracy provides yet another layer, another dimension to the dynamics and complexity of our biology. The entire world opens up to fresh ways of thinking as one contemplates again and again in setting after setting the idea that the way living things might work is not through getting it exactly right, not through the strictness of logic or the precision of hard wiring. Rather: there are “a number of ways to skin a cat,” and in the case of the human brain, an unparalleled order of flexibility and plasticity may well be the spectacular accomplishment of evolution rather than some refinements of hardware or the workings of virtual machines.

SS: Listening to your descriptions, I can imagine that an improvising dancer works with some essential capacities that are shared with the brain. One capacity relates to the ability of dance improvisers using their senses and perceptual information to create coherence in their interactions, tracking the forms through developmental arcs while allowing new movements to enter, creating new patterns. This ability resonates with my understanding of your concept of integration and differentiation in the brain. Dance improvisers can sense that fine balance between holding a pattern together while openness for new information to enter their composition. Do you think this capacity relates to your theory about *reentrant signaling* in the brain?

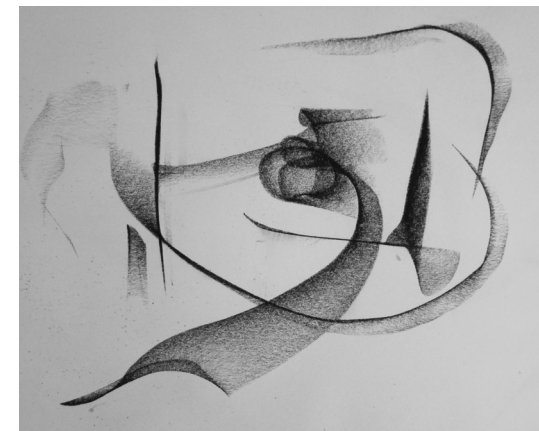
DR. E.: Allowing new information to enter and modify existing patterns and arrangements is essential for the working brain. The dense interconnectivity in the brain across so many levels and kinds of organization looks and acts more like a jungle or a rain forest

than an instance of logical planning and most certainly than anything resembling a computer. It works because of a capacity for continuous communication, called “reentrant signaling,” among active groups of neurons, not unlike the continuous back and forth communication required among improvising dancers. It is helpful to remember that even though it is not evident to us, the brain is working non-stop at an unimaginable level of activity. And it is not as if the world presents us with well-ordered and labeled clusters of stimuli. The visual system alone has more than 30 different elements of sensation that separately stimulate neuronal maps — some for color, some for movement, some for shape, and so on. Reentry is the mechanism that enables the brain to create a unitary scene out of the bombarding stimuli of everyday life, correlating light, color, sound, taste, smell, touch, proprioception, feelings, temperatures, and other internal and external states on a continuous and ongoing basis.

SS: Would it be right to say that a major focus of your work is to discover how it is that our bodies and our brains give rise to our minds—our imaginative selves?

DR. E.: Since the beginnings of abstract thought, philosophers have asked, as have Darwin, Freud and William James, what is it about our material selves that enables us to learn, to plan, to dance, to dream, to make music, to use language, to create and attach meaning, to imagine things that don’t exist. Unlike most of his scientific contemporaries, Darwin was certain that human minds sprang from our bodies, from human morphology. He believed that one day we would discover how emotions and intelligence emerged over evolutionary time and how bodies and brains produce feelings and ideas in somatic time. We are at long last beginning to cross the great divide between the body and the mind, the material and the immaterial. I am completely persuaded that every perception is not a decoding of the world, but an act of creation. And every memory is not an act of retrieval, but, to some degree, an act of imagination.

“ I have been improvising for many years now. I love this practice, because I feel like I can be truly myself in it, which is no small experience. Every time I do it, I learn more about myself and my relationship with other dancers. This experience is like being in a lush greenhouse where everything around you is growing so uniquely you have to pay attention. I love the feeling of knowing that I can discover new movements that might emerge from me today, that will teach me more about myself, and that I can focus on more difficult physical challenges and see where it takes me. I enter the space with improvisers I have been working with for many years. We know each other’s dancing like we know each other’s verbal habits. We can easily pick up interesting dance phrases between us, know if we want to chorus or initiate new material, track global patterns as they emerge, and create strong spatial landscapes. But there is always the possibility and the probability that we will witness something new today that we have either missed before, or is some new combination of elements. Today we are focusing on developmental arcs in our composing. What kind of beginning do we need to shape that gives us plenty to work with? How will it develop? Do we need signals and references all the way through to carry the material? When is the end coming? Has a narrative emerged and what is the story? How do we signal each other and negotiate when we have no predetermined script? I am excited to see how we build the complexity today. It is my own personal laboratory and I am glad to be in it once more.”



Drawing by Marie Lynn Haas.
Dancers: Carson Efird, Zornitsa Stoyanova, and Katie Martin in *The Emergent Improvisation Project*, 2006. Photo by Paul Kyle.



EMERGENT FORMS

As in the science of complexity, in EI, *forms* appear when there is enough order in the interaction of components to sustain a recognizable pattern and enough freedom to continuously integrate and adapt to new information. This condition is a delicate balance, defining the lifespan of a form before it dissolves or collapses. In EI, once we identify forms that emerge out of the improvisation, we use them as frameworks for development.

Over time, an ensemble builds the capacity to identify recurring patterns of development. We can then order the structural elements that guide a particular developmental pattern and repeat them. Each of the forms we've identified in Emergent Improvisation has its own specific nature. In the description of each form below, we include a sequencing of the various components, building from simple to complex. The sequences clearly indicate the building of complexity within each form and practice helps us to understand its essential elements. The forms can also unfold in more open-ended environments. It is important to note that these forms can be adapted as practices for musicians as well as dancers. We have identified and named four forms, the fourth currently under development.

Complex Unison Form

The Complex Unison form evolves in three stages:

Gathering

Gathering has four simple rules: walking, varying speed, varying direction, and stillness. There are two possible ways to begin spontaneously: one by one, or all at the same time. The ensemble can then divide into smaller groups and remerge at will, but the rule is that an individual cannot go off as a solo. There is no particular leader. Individuals attend to who is nearest them, the small group around them, and the whole space. Like the movement of a flock of birds, patterns begin to form. The simplicity of the structure keeps the focus on the self-organizing nature of the group. The ensemble notices patterns in their collective behavior.

Simple Unison

Simple Unison begins when a dancer adds a gesture to their walking or stillness that the others can respond to or mimic. Initiating, assembling, and dissolving group relationships; amplifying (or multiplying) gestures through the space; and creating tableaux are each elements in Simple Unison. It is not about perfect imitation, but rather similarity in shape and timing. Simple variations in direction, level, and speed produce a shifting landscape. Bird migrations, schooling fish, herds of antelope crossing a savanna, and clumps of leaves wafting across a field are simple unisons found in nature.

Complex Unison

In Complex Unison, more complicated phrasing and variations develop within the ensemble, creating reference points as the ensemble explores more diversity while maintaining the coherence of the relationships of the whole group. Solos and small groups, and main events and choruses are possible.

Based on patterns found in nature, Complex Unison reveals the progression from groups of individuals in space, to a unified sharing of material, and finally to the interplay of that material. It is an open-ended process where the ensemble is constantly adapting to new information and integrating new structures that emerge and dissolve over time.

The Simple Unison phase reveals Kauffman's *order for free*, as the dancers continuously select for patterns in a zone between chaos and order. The Complex Unison phase reveals an interpretation of Bak's *self-organized criticality* where, without an outside director, patterns evolve into a prime state for change, displaying endlessly adaptive and complex behavior. There is a finely tuned balance between the new information of variation and the patterns that are holding the material together. Here also, Edelman's concept of *degeneracy*—the ability to develop many different ways to get to a similar outcome—is in evidence. Performers are continually selecting for dynamic interactions among elements that result in a strong collective pattern. The observer can witness a continual assembling, dissolving, and reassembling of patterns.

Memory Form

"*The number of such differentiated scenes seems endless, yet each is unitary. The scene is not just wider than the sky, it can contain many disparate elements—sensations, perceptions, images, memories, thoughts, emotions, aches, pains, vague feelings, and so on. Looked at from the inside, consciousness seems continually to change, yet each moment it is all of piece—what I have called 'The remembered present'—reflecting the fact that all my past experience is engaged in forming my integrated awareness of this single moment.*"

—Gerald Edelman

In this form, the dancers create an event that is observed by the ensemble which then recalls and reconstructs the event over time. Inspired by Edelman's concept of *the remembered present*, memory of the initial event reveals itself as a fluid, open-ended process in which the performers are continuously relating past information to present thinking and action. Memory of action is based on observations of relationships of time, space, and gesture. Its reconstructions develop variations that reveal subtexts through continual selection of valued information. The reintegration of past into present draws on repetition, nonlinear sequencing, and attention to the emergence of patterns to construct new adaptations.

The Memory Form unfolds in five phases:

The Event

The ensemble creates an event that usually consists of a sequence of five to seven short simple movement phrases. Each phrase is offered spontaneously, one after the other, by individual dancers entering into a defined spatial frame, e.g., a square. The dancers remain in the space until the entire sequence is complete. They then return to the outside of the frame.

Repeated Event

The same dancers repeat the same sequence of phrases to the best of their memories.

Substituting Roles

The event is repeated again with each dancer taking a different dancer's role in the same sequence. This phase can be repeated a number of times, with different dancers substituting for each other's roles each time.

Multiples

The event is repeated a number of times, each time with groups of dancers spontaneously filling singular roles. The sequence of the original phrases can begin to be varied. While on the outside, dancers have a view of the composition as it unfolds which informs their choices about when, where, and how to enter the reconstructed memory.

The Remembered Present

This is the fulfillment of the form where dancers begin to play with the texture and quality of the original phrases and select smaller portions of them, revealing subtexts or new narratives embedded in the material. The original event is no longer being replicated, but plumbed for deeper meaning by the collective memory of the ensemble. Dancers continuously exit and reenter in a process of composing, remembering, and reconstructing their present reading of the unfolding movement metaphors.

“My duet partner enters the space creating a large sweeping movement that ends in a lunge and is accented by a sharp turn of the head. As I observe, I notice the timing and quality with which she executes her movement. She finds an end as I enter, recalling her movement. I add to the phrase by using her sharp head gesture to initiate a turn that brings me to the floor. Then I inch toward the front of the space before finding my way back to standing and exit. I observe her recall, enjoying the slight variation she makes to the floor movements I’ve made. As we alternate moving and observing one another, we begin to find a shared timing, which I can sense when we execute the new phrase together. We pause as the phrase comes to an end.

When I begin to move again, I play with new variations in quality and timing as I repeat and reorder the phrase. I become interested in a new sequence and begin to explore new movement possibilities from this place. As I shift and slow down, I spot my partner in my peripheral vision. I pause for a moment to watch her variations of the material. She moves down the diagonal making large leg gestures that alter the previous fluidity of her timing. Captivated by her phrasing, I join her on the diagonal pathway. We meet in the middle and share a moment of unison before exploring the material together. We play off of each other’s timing, finding a range of partnering possibilities. We find stillness and exit together before reentering the composition in reference to our new material.”

Photos by Terry Gannon



Recall Form

“Social psychology studies have demonstrated that imitation and mimicry are pervasive, automatic, and facilitate empathy.”

—Marco Iacoboni

The Recall Form is influenced by scientific theories related to *mirror neurons* in the brain. These neurons, which activate both when we observe the actions of others and perform or do those actions ourselves, are believed to provide the capacity to empathize and understand the intentions of others. The capacities for empathy and non-verbal communication are central to building an improvisation ensemble’s ability for self-organization and collective choice-making.

The Recall Form unfolds in four stages:

The Duet Exchange

One dancer begins by performing a series of three or four movements she has created while the other observes. The other then instantly recalls what she has seen and adds a few new movements while the first observes. They continue to take turns adding new movements, observing one another, and recalling the accumulated material until they’ve established a phrase that encompasses elements of each individual’s offering, but is new to both.

Unison Recall

The two dancers execute their new phrase at the same time. Unison in this case does not require the dancers to achieve the same timing, quality, shape, but allows them to acknowledge and experience the new material by performing it together. This prepares them to transition into the next phase.

left: Marie Lynn Haas and Emily Climer.

Excavation

The dancers simultaneously begin to develop the newly created vocabulary for themselves, co-existing in the space as they expand and hone the core of their material. Each investigates the qualities, rhythms, emotions, and subtexts of the movement. During this phase, they can intermittently come to stillness and observe their partner. As new movement and patterns begin to emerge in their awareness, the dancers shift to explore compositional and relational possibilities of the material to the space and each other. When they feel they’ve accumulated enough shared experience, they arrive at stillness and exit the space.

Duet

Using their shared vocabulary, the two reenter to construct an improvised composition that reflects and responds to the experience they’ve accumulated. Their memories shape how the composition will unfold. Their responses can involve spontaneous reactions or follow an unfolding opinion, image, or new idea. The dancers maintain a willingness to engage with, repeat, support, and explore their partner’s movement choices and ideas. This encourages a deep sense of listening and a shared sense of responsibility for what emerges.

The Recall Ensemble

The Recall Form can be explored with larger ensemble groups and with musicians. When working with an ensemble, it is crucial to limit the amount of material initially presented by each participant to one or two actions. Musicians are co-participants throughout, initiating material as individuals during the exchange phase, then generating and developing the elements of their sonic and movement vocabulary individually and collectively.

Landscape Form

The Landscape Form is currently in an early stage of development. We include it here as an example of how an ensemble comes to identify and define the building blocks of a form.

Over time, within our practice, we began to notice recurring patterns that reflected the structure of natural landscapes. In the spring of 2010, we organized a small working group to explore what structuring principles are at play when these images arise in our perception. We began by identifying visual patterns that are commonly recognizable as a landscape. Then we looked for structuring principles that could guide the ensemble's attention to these patterns during an improvisation. These principles included *spatial relationships*, *texture (weight, qualities of movement)*, *amplification*, *repetition*, and *nesting*. Finally, we observed how constraining our improvisation to these compositional elements would affect our composing.

Structuring from the visual into the language of EI:

Visual Image: We begin by looking together at a visual image of a landscape—a photograph, a painting, or a view of a real natural setting. We identify the essential compositional elements of the image, which might include foreground/background, pervasive textures, and spatial relationships.

Identification of Structuring Principles: We translate these elements into structuring principles that can guide the movement vocabulary and interactions of the dancers. Textures within the image might suggest particular qualities of fluid states to guide the movement vocabulary. Spatial relationships in the landscape might guide the ensemble's use of space. The elements of the landscape image might also suggest a nature of relationship between events, e.g., the passing of time (i.e. washes, retrogrades, rhythm, or theme and variation).

Practice: We enter the improvisation using the structuring principles as constraints.

Adaptation: Once the ensemble has experienced the landscape from the initial structuring principles, we enter a process of selection through repeated practice—adapting and renegotiating the structuring principles to best capture or embody the nature of the landscape. This phase involves consideration of what degree of constraints enables us to repeat a specific landscape while offering the greatest possible freedom of choice-making to the performers.

Application: The ensemble can apply the constraints built in this process to recognizing and developing landscape images within open-ended improvisations. Setting up a pathway, a strong foreground/background relationship of contrasting textures, or a solo that amplifies gestures of other dancers throughout the space can become signals to the group that a landscape form is emerging.

Photo by Terry Gannon



Dancers: Emily Climer [front left, counter-clockwise], Marie Lynn Haas, Corina Dalzell, Lydia Chrisman, Nikolaus Tsocanos.
Drawing by Emily Climer.

“

I enter using the diagonal to establish a sense of place. My partner has entered at the far end of the diagonal and we exchange a series of movement phrases before coming close together and breaking away from the fixed space of the diagonal. Together we move upstage, opening and expanding the space to form a new pattern.

Our movement is playful as we observe and respond to each other's timing.

I begin to approach my partner slowly as she solos near the edge of the space. We meet again, this time coming to touch as she anchors her weight on my back and the dynamic shifts again, marking the beginning of the end.”



REFLECTIONS ON THE PRACTICE AND PERFORMANCE OF EI

Katie Martin

I first encountered Susan Sgorbati’s improvisation work in 2000 as student at Bennington College, when she was just beginning to investigate the underlying structure of recurrent patterns in ensemble practice and was soon to encounter the science of complexity. Over the last 10 years, I’ve had the opportunity to deeply observe, experience, and reflect upon the evolution of this work as a practitioner, performer, teacher, choreographer, and writer. I recognize a handful of attributes embedded within both the solo and ensemble practices of Emergent Improvisation that have integrally shaped and continue

to illuminate my own artistic practices and philosophies, not only as an improviser, but as a choreographer and teacher. These practices call for an exploration of the unknown, a sense of risk-taking, and an ability to fully perceive the nature of particular phenomena and make connections between ideas, movements, and people. Inherent within all these capacities is the very essence of complexity—an arena full of open-endedness, fluidity, ambiguity, and unpredictability.

What follows is an attempt, in a non-linear fashion, to articulate these most resonant experiences:

- embodiment

as an improviser, I work from the foundation that the moment of performance is the only instant in which I exist

preparations in this art of being suggest that I approach the work through the image of aligning my sense of self with my present, ever-evolving physical reality

this includes:
embeddedness/centering in a particular environment
connecting to breath, gravity, physical sensation
allowing the striations of residual thoughts to dissolve into moment-to-moment awareness
attuning to the minutiae of felt experience following curiosity and instinct
cultivating presence in stillness/silence
embracing the subtlety and continual evolution of perceptual experience

movement arises as a deep inner motivation and understanding of the sensate self
movement becomes mindful, experienced from the inside out
movement as the unfolding recognition of oneself, an intelligent and dynamic kinesthesia

body-based meditation

- developing a physical vocabulary

from an embodied state of awareness, I begin to discover and articulate a distinct physical self

a physicality that reveals my particular movement history, inclinations, and memory while integrating the present

a physicality that springs from an investigation of the physical materials at hand—in the case of a dancer, my corporeality—much like a drummer with a kit, or a sculptor with wood, metal, or clay

a continual process of discovery and refinement, an experience of thinking through movement
the shaping of a unique technical foundation and philosophy, open-ended and ever-evolving body as movement research

- active receptivity

a cyclical transference of energy from self to environment, environment to self
an internal awareness moving outwards, connecting and interacting with the external environment, bringing information back in

multi-dimensionality of focus and presence: moving fluidly across a solo world, the local environment, and a global perspective
the essence of self-organization: can I lead and follow simultaneously?
a constant perceptual process of adaptation and integration
instant readiness

- clarity/restraint

moments of movement embedded within a landscape of stillness
sensing the lifespan or arc of the work unfolding and embracing my place within it
fine-tuning my use of energy and understanding how to best articulate this quality in the moment

- agency/autonomy

cultivating conditions in the movement environment that allow for a balance between structure and freedom, constraint and open-endedness
attuning to and working with the particular sensorial intelligences and artistic dispositions of each participant
finding the forms that best reveal the life of the movement present within the performers
embodied presence and empowerment

Jake Meginsky

Musical “Voice” and Embodied Technique

September, 2011

It is often said that one of the most intangible and difficult aspects of instrumental music is the development of a “voice,” a personal sonic gestalt, which distinguishes one’s musical identity from all others. Musical analysis will always fail to produce a definitive answer to what makes Coltrane’s saxophone playing sound like Coltrane, or what separates Glenn Gould’s *Goldberg Variations* from other interpretations.

You simply know it when you hear it. When you do hear it, there is a sense that something deeper than the combination of formal elements of music is at work. When a musician is in possession of a distinct voice, even the tiniest sound is amplified by presence and intention, creating the potential for a kaleidoscopic range of meaning and emotional response. The listener is aware that there are deep and personal underpinnings to each sonic utterance and that something substantial is at stake. Traditional musical instruction steers the budding musician away from developing this elusive characteristic by immediately initiating him or her into a hierarchical system of training, where “voice” can only come after the mastery of a large body of vernacular instrumental technique. Inside this structure, one’s sonic character arises out of rudimentary exercises that are created in service to music birthed in separate times, cultures, and spaces. Often this leaves a musician who is not content in mimicking past innovations unsure how to proceed as an individual while facing the monumental scale of the idiomatic history of his or her chosen musical materials.

Emergent Improvisation is not an idiom. Created as a complex, non-hierarchical collection of methods, practices, and structures, EI is designed to equip each musician with the necessary tools to engage in solo and collaborative art-making as both a composer and a performer simultaneously, developing the ability to integrate his or her unique sensibilities through the activation of an individual sonic vocabulary inside the dynamic arena of creation.

The four experiences that comprise the Emergent Improvisation musical practice help leverage the power of each

individual’s entire sonic history and natural inventive curiosity. Each particular experience helps to shape a distinctive and potent musicality by reframing these personal and wide-ranging musical elements as the fundamental building blocks of practice and performance:

Embodiment: The examination of one’s musical instrument as raw material—free of idiom—with a focus on the acoustics of both the body and the musical materials

- A process of centering the body via various awareness modalities of breath, concentration, silence, and subtle movement of both the body and of one’s instruments
- The cultivation of a heightened sense of listening

Development of a Sonic Vocabulary: An embodied instrumental technique emerges from this practice, encompassing such elements as vibration, detail, phrasing, tone, nuance, gesture, pulse, duration, timbre, tonality, silence, structure, form, texture, and intention

- The activation of physical energy through one’s individual sound history and memory
- The integration of various sonic influences by bringing awareness to one’s identity as a listener
- Attuning oneself to the potential sonic quality of the discrete parts of the particular musical materials and exploring the various ways that these materials can be set into vibration
- Searching for and tracking one’s emotional and psychological responses to the sound one creates

Awareness of the Spatial Environment: A multi-dimensionality of attention is developed through an interior and exterior sense of time, space, and vibration

- The relationship of one’s internal compositional signals and impulses interacting with the external awareness of self and others present in the environment

- Bringing attention to the connection between one’s sound making and the space in which it occurs by cultivating a sense of focus around physical sonic properties, such as refraction, reflection, resonance, and sympathetic vibration

Focus on the Particular: The use of repetition and restraint to develop and fine-tune this particular sonic vocabulary so that it can be freely accessed in both practice and performance.

- The narrowing and selection of material for compositional development and refinement with attention to the particularities of a specific and singular set of sounds and techniques, exploring their

scale, range, potential for personal meaning, depth, and scope through various iterations and dynamics.

- These four components are placed at the very center of Emergent Improvisation, ultimately shaping a practice in which the notion of a distinct musical “voice” is made less mysterious and becomes immediately accessible to every musician.
- From the moment the musician engages with these experiences, the development of “voice” is nurtured in a symbiotic relationship with an embodied technique. Both of these aspects continuously emerge out of, as well as create, a unique physical and psychological relationship with one’s chosen musical materials.

Dancers: Marie Lynn Haas, Emily Climer, Emily Anderson [behind]. Photos by Terry Gannon.



LANGUAGE OF EMERGENT IMPROVISATION

Adjacent Possible: can be said to be the creative potential for something to exist; a space of possibilities; the ability of a system to create something else, or to go from an existing space to a new one.

Adaptive Functionality: the potential of a system to adjust effectively to what works or matches the form to the content.

Accumulation: a compositional structure where movements are continually added to an initial gesture.

Amplification: the ability of an ensemble to quickly signal referential movements across large spaces through the use of repetition, unison, and rhythm.

Attention: “the ability to consciously select certain features from the vast array of sensory signals presented in the brain.” (Edelman, *Wider than the Sky*)

Body Mapping: a practice of attention to the volume, depth, and length of body parts using touch and mental awareness; personal geometry.

Body Scan: a practice of personal awareness/embodiment of one’s alignment, mechanics, energetic potential, and response to stimuli.

Boundaries: the borders or margins, usually in physical space, which reign in the activity of a structure or system and set limits leading to pattern formation; boundaries can exist within the individual improviser, the ensemble, and the space.

Charge: a structure identified by artist/improviser Penny Campbell that includes the entire ensemble crossing the space together with intense energy, focus and speed.

Communication: the process of exchanging nonverbal meaning with others that calls upon an individual to uniquely define her/his own potential for expression and then negotiate that vocabulary in relationship with others in the environment. The exchange of meaning within a dance ensemble can be through the use of physical metaphor, narrative, energy/textures, geometries, and spatial patterns, but at its heart relies on awareness and responsiveness to the decisions of others. Capacities necessary for communication are pattern recognition, negotiation of roles, listening, tracking, attention to development, and balancing individual and collective choice-making.

Complex Unison: an Emergent Improvisational form based on the observation of natural systems which exhibit self-organizing structuring principles, revealing the progression of 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.

Complexity: a structuring at the edge of chaos, where there is enough order to recognize a pattern yet enough openness to be adaptable to new information leading to the creation of a new property or outcome. In Emergent Improvisation, the capacity of an individual and an ensemble to self-organize movement vocabulary in which the sum of the movement patterns is greater than the individual gestures and phrasing.

Composition: the temporal unfolding of the lifespan of an emergent form.

Constraints: frames in a system that allow for self-organizing or arising structures to become visible or understood; driving forces or rules that hold space for or mark initial conditions of a system; systems that break boundaries have no constraints.

Degeneracy: the ability of different structures to carry out the same function or yield the same output. For example, if one does the same reach for an object multiple times, the reach will look the same, but every reach will have a slightly different trajectory, timing, and quality of movement.

Development: the process of growth, maturation, progress, and/or change that occurs in an organism, structure, or form; “the capacity of selection to find novel mechanisms opening new families of forms” (Kauffman, *Origins of Order*).

Embodiment: the view that the mind, brain, body and environment all interact to yield behavior. Used in some sense to contradict the idea of a “disembodied mind” or dualistic consciousness (Edelman). In EI, embodiment is a practice and foundation that lies solely in accessing one’s own body information as a unique, dynamic, and open-ended source for the development of personal kinesthesia and/or the selection of personal movement vocabulary (rather than relying exclusively on exterior sources of movement instruction based on image and/or historical techniques). Its basis lies in the recognition and understanding of oneself and in the experience of thinking while moving. This experience of embodiment is accessed through a variety of means: breath, body awareness, body scanning, attention, sensory/proprioceptive awareness, and mapping.

Emergence: a phenomenon of self-organized criticality, whereby a new pattern created by dancers and/or musicians surfaces with a newly intact system of organization (created through interactions between the whole of the parts and the parts of the whole). Emergence cannot be predicted using existing principles of explanation, nor by developing a whole new framework or theory; instead, there are mutual causal explanations and constraints between phenomena in the present moment.

Energy Levels: (based on Simon McBurney’s work in Théâtre de Complicité and LeCoqThéâtre techniques) dynamic levels of intensity in an individual’s physical language: barely alive, casual, alert, intense and ecstatic.

Ensemble: the components of a system and their subsequent interactions. In Emergent Improvisation, the group of individuals who explore various ideas, structures, and forms and share a working connection or collective understanding through their interactions. This ensemble-building capacity is described as “swarm intelligence” in the sciences. It is a natural and biological phenomenon that evokes distributed group intelligence and understanding. This group capacity is determined by an order that is self-organized and made by mutual decisions, modularity, autonomy, rhythms, speed, spatial location, relationships, interactions, perturbations, adaptation, directional patterns, cluster patterns, attractors, and criticality.

Environment: the surroundings and atmosphere of dance improvisers’ structures that contributes to and affects their development and energetic milieu.

Excavation: a compositional structure that begins with a movement phrase and develops from an internal focus. This exploration can be through an investigation of textures, fluids, emotional responses, energy levels, and rhythmic diversity; what is hidden under the surface.

Field: an encompassing visual area of similarity and integration with small, distinct, differentiating characteristics; many individual elements scattered over a space working together to create a visual pattern; momentum distributed over a large area.

Fluid Systems: (based on the work of Bonnie Bainbridge Cohen and Body-Mind Centering) textural shifts in an individual’s physical language originating from the distinctive properties of various fluid

systems in the body: synovial, lymph, arterial, venal, interstitial, cerebrospinal and cellular. There is an immersion/embodiment of the mind into each system, in other words, how the insides become the outsides.

Focus: “an attentional state directed toward a single object, thought, or experience” (Edelman, *Wider than the Sky*).

Forms: frameworks for development. Forms appear in complex, interconnected systems, where there is enough order and interaction to create a recognizable pattern but where there is enough freedom to continuously integrate and adapt to new information. Over time, an ensemble builds the capacity to identify and repeat reoccurring patterns of development. The ensemble can name and order the structures that guide a particular developmental pattern in order to reconstruct a form that has emerged.

Frames: provide support and focus to an event within the composition; anchoring a space, repeating a pathway or gesture, creating a spatial relationship to the event.

Glacial Erratic: a structure identified by artist/improviser Peter Schmitz in which a large ensemble event leaves behind a new, small ensemble event.

Improvisation: a process for dancers and musicians that thrives on and is contingent upon the following: spontaneous movement and sound of an open-ended nature; non-linear, non-hierarchical time-based development; no exterior or central agent; constant trial and error; continuous seeking out, utilizing, and being affected by change; display of a high degree of adaptability; awareness of information of the present moment; subject to the interplay of internal/external multi-awareness and intentionality; a self-reflexivity between form and content (form serves the material and material serves the form).

Initial Condition: the movement origin of a sequence; a beginning or origin can be any set of movements composed into a phrase. An aspect of this phrase (such as a gesture, an action, or rhythmic timing) can be developed further, creating new material.

Initiator, Responder, Framer: a structure (identified by improviser Maureen Ellenhorn) in which one dancer leads with movement phrasing, a second dancer responds to the first dancer, and the third dancer focuses on the duet relationship of the other dancers, creating a spatial relationship to the material.

Integration and Differentiation: the ability of improvisers in an ensemble to form and recognize pattern while continuing to invent new ways of breaking those patterns and adding new material/information. There is coherence, but also open-endedness.

Landscape: a series of ensemble patterns that reflect the structural elements of spatial location (pathways, foreground and background, and distance), amplification (signaling and referencing), and textural fluid states; they can be initiated by visual sources such as landscapes from nature, photographs, and paintings.

Main Event/Chorus: a structure that sets up an open-ended dynamic between a focal point or “hot spot” and the supporting system, frame, structure, or background element.

Meaning: the significance, resonance, or implications of the information present in a pattern, structure, form or system.

Memory: implies the ability to recreate a specific mental image or a physical act. “Each event of memory is dynamic and context-sensitive—it yields a repetition of a mental or physical act that is similar but not identical to previous acts. It is recategorical: it does not replicate an original experience exactly.” (Edelman, *Wider than the Sky*)

Metatopology: the global view of a system or composition in a state of emergence.

Mirror Neurons: certain brain neurons that have been observed to fire in monkeys and humans for both the action of grasping and the equivalent action of that grasping in others of their species, when the monkeys or humans were not doing the action themselves. It is Marco Iacoboni’s theory that mirror neurons provide us an underlying capacity to empathize with others. (Iacoboni, *Mirroring People: The Science of Empathy and How We Connect with Others*)

Movement Vocabulary: fundamentals of movement that are unique to each person. Each improviser has an original and authentic language of expression that includes a movement vocabulary.

Nesting: the space within spaces; the idea that patterns reside within other patterns, simultaneously unfolding on many levels: small scale and large scale, local and global.

Order for Free: a zone poised on the edge of chaos that is a result of a highly tuned selection process. Stuart Kauffman coined this phrase and believes this is self-organization that arises naturally and underlies the construction of adaptive systems. This zone is apparent in the tendency of an ensemble of improvisers toward pattern recognition—as in forming

paths, unison, repetition, theme and variation—without pre-planning. (Kauffman, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*)

Pattern: a configuration of information or interaction in a system that has an understood sequence, design, arrangement, or relationship; a set of relationships that are satisfied by operations of a system or a collection of systems; the repetition of similar but not identical units, whereby the boundaries and constraints determine the pattern in time and space.

Performance: the presentation of particular and coherent structures, ideas, or forms, with or without an audience present.

Remembered Present: A phrase coined by Gerald Edelman “reflecting the fact that all my past experience is engaged in forming my integrated awareness of this single moment” (Edelman, *Wider than the Sky*). Memory becomes a reconstruction of past experiences and associations.

Selection: “The notion that biological systems operate by selection from populations of variants under a variety of constraints” (Edelman, *Wider than the Sky*). In improvising, this involves the choices made continually by the individual and the ensemble in relation to serving the composition and creating coherence amongst the group.

Self-organization: a state in which various elements of a system (e.g., dancers and musicians) begin to change the composition of the entire system through their own dynamic, intricate, interdependent, and multiple interactions. Primary properties of self-organization include: no external designer and no central control; attractors, as well as the system’s own structure, constrain the system; local interactions can initiate global behavior, and vice versa, in a continuous feedback loop; moving in and out of a dynamic equilibrium; an adaptation to new patterns through the selection of stability, efficiency, metaphor, and empathy; living on the “edge of chaos” (the moment of *criticality*) where there is a constant interplay of variability and stability; presence of topology or global relationship that denotes ensemble characteristics.

Self-organized Criticality: a state in which complex behavior in nature reflects the tendency of large systems with many interacting, interdependent components to evolve into a poised, delicate state, without the direction or design of a central or outside agent. This state resides in a narrow region between order and chaos, where conditions are in a prime state for change, adaptability, or evolution of some kind. The system can be highly sensitive to initial conditions of change and small perturbations

can alter it. Self-organized criticality is established solely because of the dynamical interactions among individual elements of the system. (Per Bak, *How Nature Works*)

Stillness: an active presence in an environment without movement or sound, with acknowledged self and shared group awareness of its occurrence.

Structure: a set of patterns. In the Solo Practice, these patterns emerge within the exploration of complex phrasing; in the Ensemble practice, they are patterns of relationships of space, time, and movement, such as pathway, main event/chorus, etc.

Topology: the spatial-temporal relationships among component elements; an understanding of relationship that is nonlinear and non-hierarchical; includes the concept of “nesting” or attending to patterns that are simultaneously composed on the local, regional, and global levels of the ensemble.

Tracking: the attention of improvisers to keep track of the patterns of their own individual movement phrasing, those of the dancers nearest to them, and the unfolding global patterns of the ensemble composition.

Washes: a basic compositional structure in which an ensemble crosses a space together, leaving individual dancers behind in either stillness or movement; on the return, dancers can be picked up by the ensemble to continue the crossings.

Waves and Eddies: a structure in which the ensemble moves together on a diagonal across a space with a momentum of moving forward and receding; the ensemble is choosing collectively and individually who is initiating the motion forward, in unison or not, varying levels, rhythms, textures, and energies.

SOURCES

Bak, Per. *How Nature Works: The Science of Self-Organized Criticality*. New York, Copernicus, Springer-Verlag New York, Inc. 1996

Bejan, Adrian. *Design in Nature: How The Constructal Law Governs Evolution in Biology, Physics, Technology and Social Organization*. New York, First Anchor Books. 2013.

Bar-Yam, Yaneer. *Dynamics of Complex Systems*. Perseus Books. 1997. _ _ _ . *Making Things Work: Solving Complex Problems in a Complex World*. NECSI, Knowledge Press, 2004.

Brockman, John. *The Third Culture*, Chapter 4, “Biology is Just a Dance” New York, Touchstone, 1995.

Carnazine, Scott. “Patterns In Nature.” *Natural History*, June, 2003.

Casti, J. L. *Complexification: Explaining a Paradoxical World Through the Science of Surprise*. New York: HarperCollins, 1994.

Clayton, P. *Mind & Emergence: From Quantum to Consciousness*. Oxford: Oxford University Press, 2004.

Cohen, Bonnie Bainbridge. *Sensing, Feeling, and Action*. Northampton, MA: Contact Editions, 2003.

Deacon, T. W. “The Hierarchic logic of emergence: Untangling the interdependence of evolution and self-organization.” *Evolution and Learning: The Baldwin Effect Reconsidered*. Cambridge MA: MIT Press, 2003.

Depew, D. J. and B. H. Weber. *Darwinism Evolving: Systems Dynamics and the Genealogy of Natural Selection*. Cambridge, MA: MIT Press, 1995.

Edelman, G. M. *Neural Darwinism: The Theory of Neuronal Group Selection*. New York: Basic Books, 1987.
_ _ _ . “The Wordless Metaphor: Visual Art and The Brain.” 1995 Biennial Exhibition, Whitney Museum of American Art.
_ _ _ . *Wider than the sky: the phenomenal gift of consciousness*. New Haven: Yale University Press, 2004.
_ _ _ . and G. Tononi. *A Universe of Consciousness: How Matter Becomes Imagination*. New York: Basic Books, 2000.

Iacoboni, Marco. *Mirroring People: The Science of Empathy and How We Connect with Others*. Farrar, Straus and Giroux, 2008.

_____. *Imitation, Empathy, and Mirror Neurons*. Annual Reviews, 2009.

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

_____. *The Meaning of the Body*. Chicago: The University of Chicago Press, 2007.

Kauffman, S.A. *The Origins of Order: Self-Organization and Selection in Evolution*. New York: Oxford University Press, 1993.

_____. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. New York: Oxford University Press, 1995.

_____. *Investigations*. New York: Oxford University Press, 2000.

_____. *Reinventing The Sacred: A New View of Science, Reason, and Religion*. New York: Basic Books, 2008.

Laughlin, R.B. *A Different Universe: Reinventing Physics from the Bottom Down*. New York: Basic Books, 2005.

Lipton, James. *An Exaltation of Larks*. New York: The Penguin Group, 1968.

Morowitz, Harold J. *The Emergence of Everything: How The World Became Complex*. Oxford: Oxford University Press, 2002.

Nelson, Lisa. "Lisa Nelson in Conversation with Lisa Nelson." Berlin: *ballettanz*, April 2006.

Sgorbati, Susan. "The Emergent Improvisation Project: Embodying Complexity." Northampton, MA: *Contact Quarterly*, Winter/ Spring 2007, Vol 32 no. 1. A version of this essay, "L'improvisation Emergente" was originally published in French in *Nouvelle de Danse* 53, *Scientifique-ment Danse*. Bruxelles: Contredanse, 2006.

_____. and Bruce Weber. "How Deep and Broad are the Laws of Emergence?" *Unifying Themes in Complex Systems Volume VI*, Proceedings of the Sixth International Conference on Complex Systems, eds: Ali A. Minai, Dan Braha, Yaneer Bar-Yam. Boston: NECSI Symposium, 2007.

_____. "Order for Free: A System for Composition and Communication." *Idea in Action*. Berlin: Spector Books, The Bakery, 2012.

Sheets-Johnstone, M. *The Primacy of Movement*. Amsterdam: Benjamin, 1999.

_____. *The Corporeal Turn: An Interdisciplinary Reader*. UK: Imprint Academic, 2009.

Taylor, M. C. *The Moment of Complexity: Emerging Network Culture*. Chicago: University of Chicago Press, 2001.

Thelen, Esther and Linda B. Smith. *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge: MIT Press, 2002.

Tononi, G. and G. M. Edelman. "Consciousness and Complexity." *Science* 282:1846-1851, 1998.

Volk, Tyler. *Metapatterns: Across Space, Time, and Mind*. New York: Columbia University Press, 1995.

Weber, B. H. "Emergence of life and biological selection from the perspective of complex systems dynamics." *Evolutionary Systems*. Ed. G. van de Vijver, S. Salthe, and M. Delpo. Dordrecht: Kluwer, 1998.

_____. "Closure in the emergence of life." *Closure: Emergent Organizations and Their Dynamics*. Ed. J. L. R. Chandler and G. van de Vijver. *Annals of the New York Academy of Sciences*, 501:132-138, 2000.

_____. "Emergence of mind and the Baldwin effect." *Evolution and Learning: The Baldwin Effect Reconsidered*. Cambridge MA: MIT Press, 2003.

_____. and T. W. Deacon. "Thermodynamic Cycles, Developmental Systems, and Emergence." *Cybernetics and Human Knowing*. UK: Imprint Academic, 7:21-43, 2000.

_____. and D. J. Depew. "Natural selection and self-organization: Dynamical models as clues to a new evolutionary synthesis." *Biology and Philosophy journal*. 11:33-65, Springer Netherlands, 1996.

Wicken, J. S. *Evolution, Information and Thermodynamics: Extending the Darwinian Program*. New York: Oxford University Press, 1987.

Contact Quarterly

In Print and Online

dance journal

chapbook

dance directory/

ad supplement

online journal

ci newsletter

ci webtexts

ci contacts list

books, dvds

kneepads

Coming Up

CQ journal 2014
volume 39 no 1

Submissions welcome
year-round.
submissions@
contactquarterly.com

Check our website for
new online writings,
posted throughout the
year

and to Subscribe
and Advertise
Participate

in any number of ways

info@contactquarterly.com / ph 413 586 1181

www.contactquarterly.com

a vehicle for moving ideas

BIOGRAPHIES

Susan Sgorbati has been involved in the field of dance for over thirty years as a choreographer, artistic director, dancer, and teacher. Since 1983, she has been on the Dance Faculty at Bennington College in Vermont where she has co-taught numerous interdisciplinary courses with biologists, musicians, visual artists, and anthropologists. Her focus on dance improvisation for performance coalesced into an on-going research into the relationship between dance and music improvisation and the science of complex systems, which she named Emergent Improvisation (EI). Her initial meetings, a decade ago, with eminent scientists in the field of complexity, Dr. Bruce Weber, Dr. Gerald Edelman, and Dr. Stuart Kauffman, inspired the direction and naming of her work and she sustains dynamic on-going dialogues with each of them and others.

These interactions have taken many forms: co-teaching and co-authoring a paper with Dr. Weber; winter residencies (2004 to 2006) at The Neurosciences Institute in La Jolla, California under the tutelage of Dr. Edelman, where her *Emergent Improvisation Project (EIP)* performance was heralded by *The San Diego Union-Tribune* as one of the “Top 10 Performances of 2006;” presentation of collaborative research with Dr. Kauffman at a symposium sponsored by The National Endowment for the Arts and The National Science Foundation in Washington, D.C., 2010, and participation in Dr. Kauffman’s complexity-focused interdisciplinary Crazy Salon at the University of Vermont.

Sgorbati has presented her EI research at the 6th International Conference on Complex Systems [hosted by the New England Complex Systems Institute] and the Conference on Emergence hosted by the Star Island Institute for Science in the Age of Religion.



Her writing has been published in *Contact Quarterly* dance journal, *Nouvelles de Danse* (Belgium), and the anthology *Idea in Action* (Berlin: Spector Books, 2012).

Her dance work has been presented at many venues and festivals in New York City and New England. In 2006, Sgorbati received a National Performance Network Creation Fund Grant to develop and tour original performance work (*Emergent Improvisation Project*). In 2011, she was granted a Creative Research Residency at the Experimental Media and Performing Arts Center (EMPAC) at Rensselaer Polytechnic Institute to explore

her new research on “emergent structuring.” She is currently collaborating with filmmaker Elliot Caplan on *Convergence: The Emergent Improvisation Film*.

Parallel to her dance career, Sgorbati is a professional mediator with extensive training and expertise in both multi-party and environmental dispute resolution for which she has received numerous honors and awards. Since 1999 she has mediated cases for the Vermont Human Rights Commission and holds The Barbara and Lewis Jones Chair for Social Activism at Bennington College where she is currently Curriculum Coordinator for the new Center for The Advancement of Public Action. Sgorbati began implementing the communication structures of Emergent Improvisation in her conflict resolution practice on a recent trip to the Middle East and is in the process of writing about it.

EIP continues to forge new connections both nationally and internationally with organizations and institutions devoted to interdisciplinary research, education, cultural development, and unique platforms for performance. (www.emergentimprovisation.org)

Photo by Terry Gannon.

Emily Climer currently works on the literacy team of Student Achievement Partners, a nonprofit of educators and researchers who design actions to improve student achievement in the U.S. She is deeply interested in the applications of the mediation, communication, and adaptive structuring processes embedded in the practice of Emergent Improvisation to working within social systems. From her base in Red Hook, Brooklyn, she continues to improvise and create her own dance work.

Marie Lynn (Blocker) Haas is currently volunteering in home-based programs for children with Autism in Singapore. Her passion for this work emerged during the development of the Emergent Improvisation Recall Form and her subsequent correspondence with neuroscientist Marco Iacoboni (*Mirroring People: The Science of Empathy and How We Connect to Others*). She is interested in how forms of mirroring and non-verbal communication can foster empathy and interaction in social contexts outside the realm of dance. Her work with these children serves equally as the platform for her latest explorations in the dance studio.

Dr. Gerald Edelman is the founder of the Neurosciences Research Foundation, and the Director of The Neurosciences Institute in La Jolla, California. Dr. Edelman received the Nobel Prize for Medicine in 1992 for his studies on the structure and diversity of antibodies. Dr. Edelman has made significant research contributions in biophysics, protein chemistry, immunology, cell biology, neurobiology, and genomics. More recently, he has formulated a detailed theory to explain the development and organization of higher brain functions in terms of a process known as neuronal group selection, and he has extended this work to provide a biologically based theory of consciousness. His latest books are *Wider than the Sky: The Phenomenal Gift of Consciousness* (2004) and *Second Nature: Brain Science and Human Knowledge* (2007).

Dr. Stuart Kauffman is a MacArthur award recipient, formerly of the Santa Fe Institute, and founding Director of The Institute for Biocomplexity and Informatics at the University of Calgary in Canada. He holds a distinguished faculty position at the University of Vermont at their Complex Systems Center and is a Finland Distinguished Professor at Tampere University of Technology. His many books include *The Origins of Order*, *At Home in the Universe*, *Investigations*, and *Reinventing The Sacred*.

Dr. Bruce Weber is an evolutionary biologist, a Robert H. Woodworth Chair in Science and Natural Philosophy Emeritus at Bennington College, and Professor of Biochemistry Emeritus at California State University Fullerton. His research interests are in macromolecular evolution and the history of biochemistry, especially the conceptual development of bioenergetics. In addition to numerous scientific articles, he has co-authored *Wandering in the Gardens of the Mind: Peter Mitchell and the Making of Glynn* and *Evolution and Learning: The Baldwin Effect Reconsidered*.

Katie Martin is a dance artist and recipient of the national Jacob K. Javits Fellowship in Dance, working within the overlapping spheres of choreography, performance, education, and movement research. She continues to present and perform her work in New York City and nationally and teaches dance at colleges throughout New England. She lives in Northampton, Massachusetts.

Jake Meginsky is a composer and percussionist living in Northampton, Massachusetts. His recordings can be found on Feeding Tube Records (Northampton, MA), Rel Records (Providence, RI), Open Mouth Records (Northampton, MA), Hells Half Halo (Seattle, WA), Wooden Finger Records (Belgium), Ultra Eczema Records (Belgium), and Ecstatic Peace Records (Northampton, MA).

“ I don’t know what this is that I’m trying to invent. I don’t know what the “it” is that I’m trying to invent any more than you know what the dance is that you’re trying to invent. And that’s why I think—not to be purple about it—that we’re missing our deep humanity. I think our deep humanity is in this. This is why I think the sciences and the arts have to come together with everything else. I don’t think our culture serves our humanity. I think we need a spiritual rebirth.”

Stuart Kauffman (in conversation with Susan Sgorbati, 2010)

“ You see, this is where I feel like this is so radical. It finally unites these things. Sciences have one way of thinking about things, and aesthetics or arts have another. If both are based on structuring principles that are some reflection of humanity or the deepest part of ourselves, if we were to understand some of what these structuring principles are, then we are really united.”

Susan Sgorbati (in conversation with Stuart Kauffman, 2010)

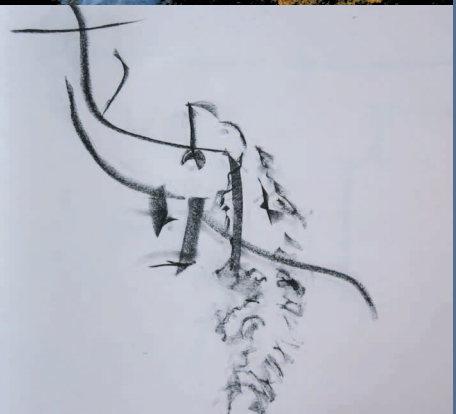


Katie Martin. Photos by Jake Meginsky.

Contact Quarterly

a vehicle for moving ideas

www.contactquarterly.com



\$15/U.S.