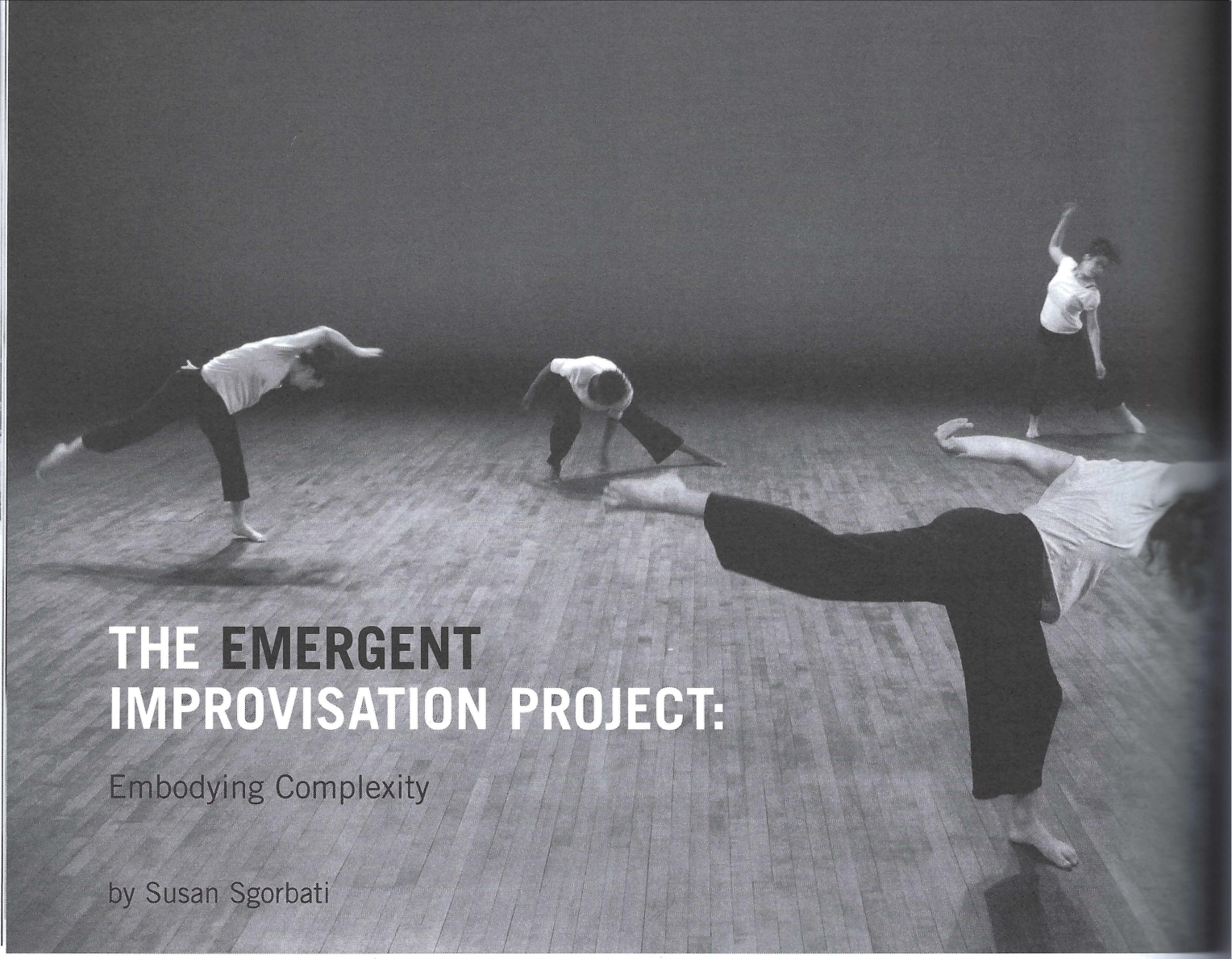

THE EMERGENT IMPROVISATION PROJECT:

Embodying Complexity

by Susan Sgorbati

"Nature is regulated not only by a microscopic rule base but by powerful and general principles of organization. Some of these principles are known, but the vast majority are not."

—**Robert Laughlin** (Nobel Prize in Physics, 1998)

Field. **Performance of the Emergent Improvisation ensemble at the Martha Hill Dance Theater, Bennington College, Bennington, VT, 2005.** *[foreground]* **Carson Efird;** *[background from left]* **Zornitsa Stoyanova, Jaamil Olawale Kosoko, Katie Martin.**

"*Field* is an Emergent Improvisation form in which the dancers connect across a visual field through unifying ideas of gesture, rhythm, and spatial pattern while retaining small individual characteristics."

—Katie Martin, E.I. Project dancer improvisor

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 on water they appear to shift and dodge in a dimensional dance of submersion and surface motion. There does not seem to be a leader. 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 guidance.

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 an emergent form appearing that they all recognize and understand. The dancers fall into a pattern. 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. The neurons are self-organizing, and their patterns are emergent *phenomena.*

A judge in Bennington Superior Court asks me to develop a proposal to mediate conflicts between families, schools, and the court system for children who have dropped out of school. This results in a program five years later which has served over two hundred students with a staff of sixteen. There has been no structured hierarchy in the development of this organization. It has been self-organizing, developing resources in response to the needs of the children involved. How do people (or societies) organize systems that meet specific needs? How does unified organization arise without hierarchical leadership?

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Observing these patterns in nature, in my work 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. In linking the creative work of art making to the emergent processes evident in nature, I have found a context that provides for a rich and textured inquiry into how systems come together, transform, and reassemble, and how they create communication and exchange in doing so. My research and practice, what I have come to call Emergent Improvisation, investigates the specific relationship between dance/music improvisation and the science of complex systems. Improvisation is a process of composing in the moment. By composing, I mean ordering, structuring, organizing—in this case, movement and sound. Emergent Improvisation is the ordering or structuring of forms in the present moment, without involving an exterior agent or outside director, as evidenced in many natural living systems.

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

Self-organization: In this context, the ordering or structuring of dancers and musicians without a choreographer or a director. The ordering comes from within the system.

Emergence: A potential outcome of self-organization. Emergence is the process by which some new form, ordering, or pattern develops, or some new ability arises and moves toward the creation of another idea, which that opens up or exposes the potential for something new—a collective behavior that is both different from and more than the sum of its parts.

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.

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 among dancers and musicians that arise when simple rules are followed based on certain constraints.

Besides complexity, I've observed the following factors that contribute to emergence in improvisation:

1. The dancers and musicians in improvisation have agency—that is, the choice to move or create sound. Essential aspects of agency are the sensation of being embodied (a kinesthetic awareness) and an attention to time and space, as well as developing and defining the boundaries of the performance space.

2. Movement is the energy force driving the self-organizing system. The impulse to move, to touch, to form connections, as well as to respond to defined boundaries, are essential actions by the performers.

3. The relationship of movement, time, and space within particular constraints (in scientific terms, "embeddedness") will create a coherent dynamic structure, a chaotic structure, or a rigid one that will halt the development of the composition.

4. Memory. "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 selection, choosing certain patterns over others in order to find more adaptable solutions. Dancers and musicians use this complex system of memory in their building of compositional structures.

5. "Topology." Three levels of interaction exist at once: the local neighbor interaction, the small group ensemble, and the global collective behavior. The composing dancers and musicians need to be aware of all levels or "topologies" at once, cuing each other in order to transition the structure toward a coherent form.

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I was already schooled in the Graham and Limon dance techniques when I entered Bennington College in Bennington, 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 Bill Dixon came to teach improvisation. Judith had recently come from the Judson Dance Theater in New York City, a hotbed of the avant-garde in dance. Their performance of improvisation was a radical idea at the time. Not that improvisation was radical—it was always

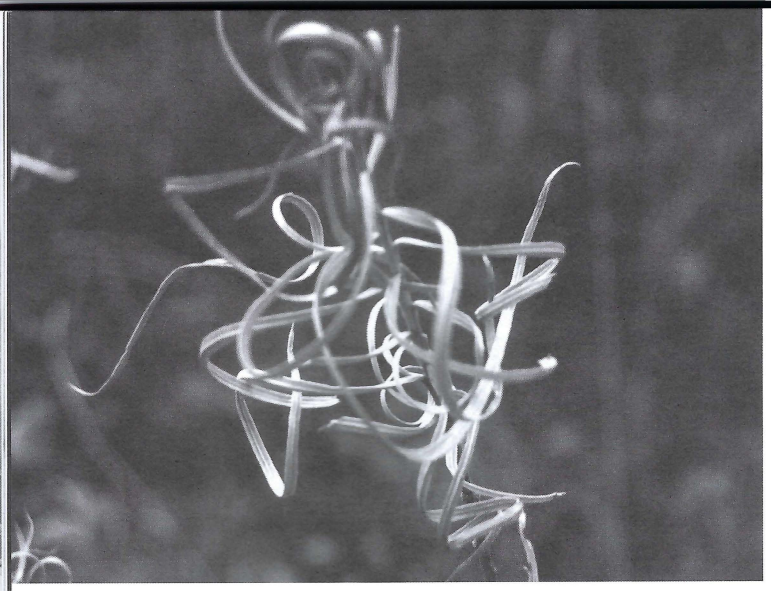

photo © Jake Meginsky

A desert plant near Sonoita, Arizona.

"One of the myriad forms of organization, expression, and movement in the natural world. Each plant has its unique development of presence, the result of multiple constraints and selections in its environment moment to moment throughout its life."

—Katie Martin, E.I. Project dancer improvisor

a part of dancing. But their idea to take it seriously as a form for performance —that there were skills involved, that it could be practiced, and that musicians and dancers were working as equals—was something very radical for the contemporary dance scene then.

Many years later, I returned to Bennington to continue 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, including Arthur Brooks, a major student and player with Bill Dixon. Over time, while watching my students improvise, I noticed that certain patterns and forms kept reappearing. I started to name these recurring patterns —such as *main event/chorus*, *unison*, and *path*. The forms were very simple. In the early 1990s, I gathered a small group of former students together under the name Materia Prima. We combined several structures together for performance as an experiment, just to see what would happen. The structures were not to be entire compositions at that point, but were simple elements (like the patterns above, including solo material) that contributed to the overall structuring of the event.

Some years later, 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. Stunned by the resonance with my work, I invited Bruce into the dance studio, and he participated in the research, acknowledging that we were experimenting with the same concepts. We agreed that we were not interested in comparing apples to oranges. Dancers are not molecules! And unlike molecules, both dancers and musicians can communicate their subjective experience during the process of emergent complexity. They are aware of what signals are effective in self-organization and can reflect on the multi-leveled attention spans required for it.

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One of the key elements of complexity is that self-organization is not entirely predictable. Scientist Per Bak coined the term *self-organized criticality*. This term relates to the 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, overriding, or outside agent. This emergent state becomes a complex dynamic system. Improvising dancers and musicians experience this interaction and interdependence when selecting for coherent patterns or recognizable states.

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. I recall the exhilaration and sense of creative energy in an artistic improvisational practice. Does a collective sense of connection (meaning) create the drive to integrate content, timing, and location in a dance or work of art? This questioning led me to conversations with two visionary scientists. The first was with Dr. Gerald Edelman, founder of the Neurosciences Research Foundation, director of the Neurosciences Institute in La Jolla, and chairman of the Department of Neurobiology at the Scripps Research Institute. Dr. Edelman received the Nobel Prize for Medicine in 1972. His book, *A Universe of Consciousness*, greatly influenced my thinking.

Dr. Edelman's work includes a theory of consciousness that is based on two fundamental properties of conscious states: *integration* and *differentiation*. Every conscious state is a unified whole and cannot be broken into individual parts. At the same time, each state is highly differentiated and leads to the possibility for many different behaviors. These concepts deeply resonated with my observation of the ensemble of dancers and musicians. The improvisations produced coherent wholes that could not be deconstructed to each dancer and musician and yet produced endless variations. I questioned whether this level of complexity was a further amplification of each dancer's and musician's conscious state.

Another concept of Dr. Edelman's theory that resonated with my work and influenced my thinking is *the remembered*

present. This concept relates perception to memory. The remembered present links the imagined or immediate present experiences with a past history of behavior. Memory is a process linking past to present, actually reconstructing the past into the present. Memory is dynamic and emergent, not static.

The second scientist whose work greatly influenced me is Dr. Stuart Kauffman. Dr. Kauffman, winner of the MacArthur Award, is a founding member of the Santa Fe Institute—the leading center for the emerging sciences of complexity. He is currently the director of the Center for Biotechnology and Informatics at the University of Calgary in Canada. In his books *The Origins of Order* and *Investigations*, Dr. Kauffman is interested in seeking 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 highly tuned selection process. When Dr. Kauffman visited Bennington College, he participated in my improvisation ensemble and inspired me to explore and name the Complex Unison Form with the dancers and musicians.

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In thinking about the deep connections between ordering principles in nature and ordering principles 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? Over the last three years, this investigation has resulted in three areas: research, education, and the practice and performance of Emergent Improvisation.

The kinds of experiences that arise in Emergent Improvisation led me to organize the form in several ways—as an individual, duet, and ensemble practice.

The first is what I call **The Solo Practice**, which is fundamental to doing this kind of work. There are four areas to this practice: *embodiment, physical vocabulary, spatial environment,* and *focus on the particular*.

I've based *embodiment* on current developed practices, including Lisa Nelson's tuning work with the senses, Body/Mind Centering®, physical therapy, and Authentic Movement. Embodiment entails tuning oneself to sensory perception and allowing for felt experiences of the body. Similar to meditation, embodiment is a practice of attention that brings you into the present moment of a physical sensorial reality.

The next area is the development of a *physical or sonic vocabulary*. This marks itself differently from learning a traditional technique and perfecting it. In this case, you're perfecting and discovering your own physical and sonic technique. You're taking your history and integrating it

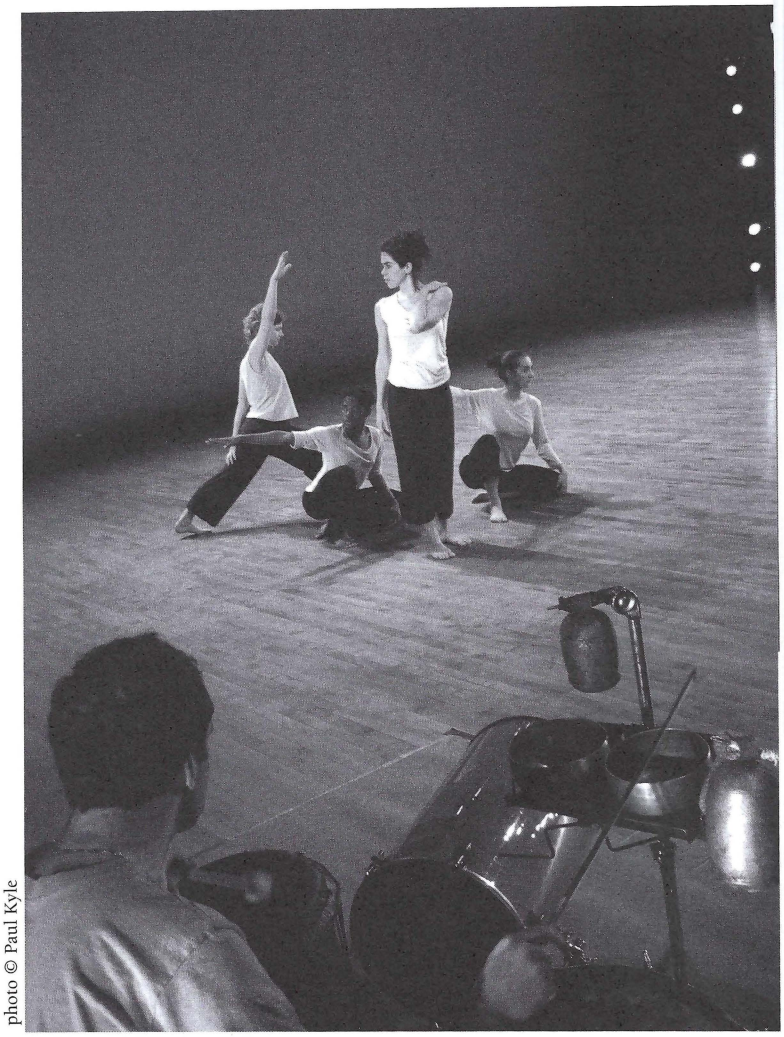

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photo © Scott Barrow

[top] ***The Reconstructed Memory Form.*** **Musician: Jake Meginsky; Dancers** *[from left]* **Carson Efird, Jaamil Olawale Kosoko, Katie Martin, Zornitsa Stoyanova; Bennington College, 2005.**

[bottom] **Musicians in the Emergent Improvisation ensemble, Martha Hill Dance Theater, Bennington College, Bennington, VT, 2006.** *[foreground to background]* **Jake Meginsky, Sean Mattio, John Truscinski.**

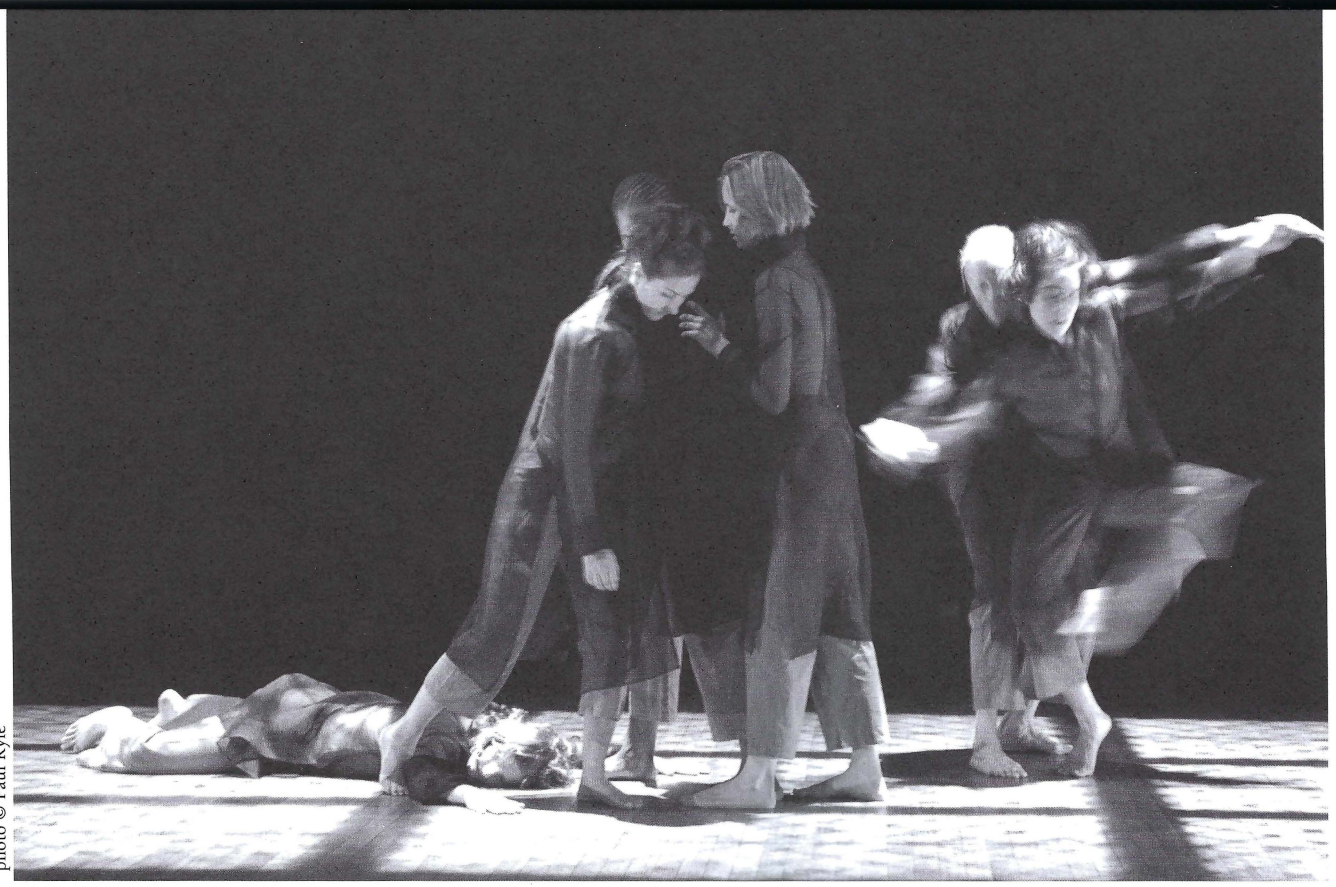

photo © Paul Kyle

The Reconstructed Memory Form. [from left] Carson Efird, Zornitsa Stoyanova, Jaamil Olawale Kosoko, Nicole Pope, Keith Thompson, Katie Martin; Bennington College, 2006.

into an emergent present where vocabulary can continually be discovered, reshuffled, and recombined, creating a thinking process in the body. The development of this vocabulary is very important because, like with any vocabulary, the more diverse it is, the more interesting it is, and the more able you are to fine-tune, articulate, and express detail and ideas. This area creates an endless practice of discovering a greater vocabulary.

The third area is an attention to the *spatial environment.* You start to transfer your internal process and attention into the space, connecting to the external world. The focus goes to the outside, addressing "location," which is a key element in the science of evolutionary biology. In order to survive, an organism must have a location—that is, be able to adapt to existing constraints in the environment. Adapting to the environment is an essential skill in improvisational work as well. The dancers and musicians need to become highly aware of each other. As they engage in developing their Solo Practice, they must engage in a deep listening and observing of each other's forms.

The last piece of the Solo Practice is the *focus on the particular.* Now that the dancer and musician have their individual vocabularies, they must select for a particular ordering, or structuring, process. Structuring one's vocabulary —choosing particular gestures, rhythms, spatial configurations, and then developing and building on them—is a rigorous practice. This area is where one discovers and defines one's own selection process for composing.

The Duet Practice is an exploration of twos. The process can involve two dancers, two musicians, or a dancer and musician. Rhythmic relationships, parallels, synergies, equalities, narratives of separation and connection, and the push/pull of unison patterns are all investigated.

The Ensemble Practice structures itself on self-organizing principles. In developing this practice, we spontaneously create structures with particular constraints or rules. These structures give us information that is then selected for and repeated. Subsequently, we began to question how we knew whether a structure "worked," or was successful, within the ensemble. It became evident that not all structures work in this practice. Not enough rules or totally random choices create few recognizable patterns among the dancers and musicians. Like complex systems, these structures have to have enough rules so that a pattern is recognizable and emerges. Also, the rules need to be flexible and open enough so that the dancers and musicians can create the conditions for an unknown form to emerge. Here, I recognize Dr. Edelman's concept of "integration and differentiation" and Dr. Kauffman's "order for free" at play.

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There are four performance forms—Emergent Forms—that I'm currently working with that arose from **The Ensemble Practice**: *the Emergent Solo, the Emergent Duet, Complex Unison*, and *the Reconstructed Memory Form.* They each begin with simple rules and build into complex

Like complex systems, these structures have to have enough rules so that a pattern is recognizable and emerges.

video still

Complex Unison. [foreground to background] **Katie Martin, Zornitsa Stoyanova, Jaamil Olawale Kosoko; Bennington College, 2005.**

patterns that are self-organizing, allow for emergence, and become complex systems that can be continually refined.

The **Emergent Solo** is grounded in the unique components of one's Solo Practice and its four disciplines. The Emergent Solo unfolds, expands, and is fulfilled through a keen compositional awareness.

The **Emergent Duet** is a performance form for a dancer and musician that arises through observation, listening, and composition. The duet seeks to create an arena for emergence and complexity to unfold. It is a dynamic process exploring movement and sound in order to select and build a kinetic/sonic vocabulary and to create a technical base of fundamentals that are unique to the two individuals.

The **Complex Unison Form** is built from the **Flocking Form**, which is based on flocking patterns found in nature. The **Flocking Form** includes four simple rules: walking, varying speeds, varying direction, and stillness. Like the movement of a flock of birds, this ensemble form begins to create patterns for the dancers. This form emerges into the **Simple Unison Form**, which allows for the addition of gesture —creating visual contexts for the dancers to respond to, revealing Kauffman's "order for free." Simple Unison then develops into the Complex Unison Form—Bak's "self-organized criticality," where endlessly complex patterns, in a prime state for change, reside between order and chaos. There is a finely tuned balance between the new information of variation and the patterns that are holding the information together. Another component of this structure is Dr. Edelman's concept of "degeneracy": the ability to develop many different ways to get to a similar outcome. Dancers and musicians trained in Complex Unison recognize when these dynamic interactions among individual elements result in a strong collective pattern. The observer witnesses a continual assembling, dissolving, and reassembling of forms.

The **Reconstructed Memory Form** is based on a simple, short dance improvisation. The movement and gestures need to be clear enough to be recognized and repeated. The ensemble reconstructs the memory of the original improvised dance over time, allowing an investigation of its potential meanings. Based on Dr. Edelman's theory of "the remembered present," this reintegration of past into present draws on elements of repetition and emergence to construct new adaptations and images for the ensemble.

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An important aspect of the success of Emergent Forms is that each individual musician or dancer has a unique and copious vocabulary. At any given moment, they must have access to highly articulated and defined elements or ideas to bring into very quick-moving windows of opportunity. They also have to have a practiced sense of attention. Without it, they will distract the focus from the developing material and literally keep the form from happening. In order for a form to emerge, it has to keep refining itself and discarding what is not useful, just as in selective evolution. The ensemble must understand the signals, track the

Complex Unison. [from left] Carson Efird, Katie Martin, Zornitsa Stoyanova, Jaamil Olawale Kosoko; Bennington College, 2005.

photo © Paul Kyle

patterns, and build on material. They must also understand how to develop images over time. While still a process of trial and error, the focus is on the emergence of the form and how it's being built, versus randomly choosing elements outside of what the ensemble is working toward.

Another important aspect for success is the many signaling techniques that dancers and musicians use to support global, collective, self-organizing behavior. There is, most evidently, vision and direction of focus to designate connection and location of attention in space. There is aural communication, which conveys rhythm, tone, and timing. There is kinesthetic awareness—the sense of movement—that, for both dancers and musicians, can result in syncopated changes and shifts. And there is conscious attention to relationship, which includes an awareness of self (where one is located in space and the vocabulary of one's movement), an awareness of local interaction (what one is doing in relation to one's neighbor), and an awareness of the global pattern (recognizing the form of the ensemble). This spatial-temporal experience of sensory awareness through many levels of attention is happening both simultaneously and spontaneously, mirroring the *selection and pruning* process that occurs in complex systems.

Amplification is another intriguing concept for an ensemble. Just as a sound can be amplified in particular environments, so can movement information among an ensemble. Advanced improvisers can very quickly signal referential movements across large spaces through the use of repetition, unison, and rhythm.

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

Emergent Improvisation as a practice and performance is not a new concept. It is simply the naming and identification of a process that many artists have been doing over millennia, and that I have found myself in the midst of explaining by using the language and concepts of complex systems dynamics. The process of discovery has in itself been self-organizing, gathering strength and clarity with each ensemble's interaction and practice of the forms.

Some questions arise regarding structuring principles across disciplines:

- Is embodiment necessary for self-organization?
- Is movement central to forming self-organizing groups?
- Are ordering principles necessarily pleasurable? In other words, is the connection or coherence created among the ensemble members always connected to pleasure?
- For emergence to occur, must several levels (topologies) be in action at once?
- Does selection over time refine a structure as well as create new adaptable ones?
- Is there a connection between a system's ability to adapt and aesthetic beauty?

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

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