

Essay on Emergent Improvisation

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“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)

A flock of evening grosbeaks collect on the branches of the trees outside my house. In the morning, they fly from tree to tree, and at one point, take off into the sunrise. It is September, and they are beginning their long migration south. I watch them form their patterns in the clear blue sky. There does not seem to be a leader. They do not bump into each other, and seem to gracefully know how to organize themselves. Their movements are quick, intricate, and reflect a remarkable sense of timing in their interactions. How do they know how to form these patterns?

I stand on my dock, overlooking a clear lake which 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. Under the reflection of the sun, they appear to shift and dodge in an endless dimensional dance of submersion and surface motion. They create endless swirling patterns, sustaining a coherence that is striking, with no apparent guidance.

The ensemble of dancers are moving across the space, spontaneously following their own movement 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 also present, and they are finding their own sound patterns in relationship to 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 Superior Court asks me to develop a proposal to mediate conflicts between families, schools, and the court system around children who have dropped out of school. Five years later, this results in a program that has served over 200 students with a staff of 20. There has really been no structured hierarchy in the development of this organization. It has been self-organizing, developing patterns that were necessary to meet the needs of the children involved. How do organizations produce a complex system?

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Observing these emergent patterns in natural living systems, in my work in dance and music improvisation, and even in organizational systems like public schools and social agencies, I've come to ask whether there are deep universal 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 basis for a rich and textured inquiry into how systems come together, transform, and reassemble to create powerful means of communication and exchange.

The research and practice of what I have named 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. Relating to natural living systems, Emergent Improvisation is the ordering or structuring of forms in the present moment that does not involve an exterior agent or outside director.

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, means the ordering or structuring of people or entities that do

not have a choreographer, or do not have a director. The ordering is coming from within the system.

Emergence--an outcome, or "property," of self-organization--is the process by which some new form, some new ordering, some new pattern, or some new ability arises to move something toward the creation of another idea---opening up or exposing the potential for something new.

The idea of complexity encompasses the process of self-organization to create an emergent form. The study of emergence in complex systems explores how the many components of a particular system give rise to a collective behavior. Complexity is 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.

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When I entered Bennington College in Bennington, Vermont as a student in the late 1960s, I was already schooled in the Graham and Limon dance techniques. I quickly became immersed in the Cunningham technique under the influence of Viola Farber. 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, which was a hot bed of avant-garde reaction/rebellion to previous modern dance. Their performance of improvisation was a radical idea at the time. Not that improvisation as a form was such a radical idea, because it was always 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.

I returned to Bennington many years later to continue the teaching of Judy's work and began investigating my own interests within dance and music improvisation. It's been over twenty years now that I've been teaching improvisation alongside musicians at Bennington, including with Arthur Brooks, a major student and player with Bill Dixon.

Over time, watching my students improvising, I noticed certain patterns and forms kept reappearing. I started to name these recurring patterns--names like "main event/chorus", "unison", and "path." The forms were very simple.

In the early '90s, I gathered a small group of former students together under the name Materia Prima. We started to create several structures together for performance as an experiment just to see what would happen. The structures were not for entire compositions or forms unto themselves at that point, but were simple elements (as 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, dynamical systems, a paradigm that had emerged as a major discussion in the scientific community over the last 40 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.

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One of the key elements of complexity is that the emergent property of self-organization is not entirely predictable. [Scientist//specific kind of 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 dynamical system. Improvising dancers and musicians experience this process of interaction and interdependence selecting for a coherent pattern or state that is recognizable.

I became interested in why ensembles of individual entities (cells, animals, people) exhibit self-organizing, collective behavior. It seems clear that there is a drive, a push, a movement, towards forming, towards coherence, towards the matching of time, matter, and location that results in meaning. The fact that collective self-organized 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) drive the energy to integrate the content, the timing, and the location? 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, California, 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 neuronal group selection. His theory states that there are two fundamental properties of conscious states: integration and differentiation. My understanding of these properties are that every conscious state contains a unified whole and cannot be broken into individual parts and, at the same time, each state can be highly differentiated and lead to many different behaviors. These concepts deeply resonated with my observation of the ensemble of dancers and musicians. The outcomes of the improvisation work 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. He defines perceptual categorization as “the ability to carve up the world of signals into categories adaptive for a given animal species.” 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 University of Calgary in Canada. In his books, *The Origins of Order* and *Investigations*, Dr. Kauffman is interested in seeking the construction principles of adaptation, believing that the property of such systems may reside on the edge of chaos—what he calls “order for free.” Poised between order and chaos, this is a result of a highly tuned selection process. When Dr. Kauffman visited Bennington College, he came into my dance studio 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 them? Over the last three years, this investigation has resulted in three areas: research, education, and the practice and performance of Emergent Improvisation.

For dancers and musicians, there are many signaling techniques that accomplish//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—which, 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), 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 is all happening at once, and spontaneously, [mirroring?] the selection and pruning process of complex systems.

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 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, the more able you are to fine-tune, to 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.??]. Adapting to the environment is an essential skill in improvisational work. In addition, 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. This practice relates to the selection [and pruning?] process. Now that the dancer and musician have their individual vocabularies, they must select for a particular ordering, 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 Solo Practice can develop into The Solo Emergent Form--a performance form that results when the four initial conditions bring about the development of the material.

The Duet Practice is an exploration of twos. 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 repeated structures with particular constraints or rules which gave us information which was then selected for and repeated. We began to question how we knew whether a structure "worked," was successful, within the ensemble. It became evident to me that not all structures do work in this practice. Not enough rules, or totally random choices created few recognizable patterns among the dancers and musicians. Like complex systems, these structures have to have enough

inherent rules so that a pattern is recognizable and emerges. Also, the rules need to be flexible and open enough to leave room for the dancers and musicians to create the potential for the unknown emergent form to happen. Here, I recognise Dr. Edelman's concept of "integration and differentiation" and Dr. Kauffman's "order for free" at play.

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There are two performance forms for ensembles that I'm currently working with: the Complex Unison Form and the Reconstructed Memory Form. They each begin with simple rules and build into complex patterns. They are self-organizing; they have emergent properties; and they become complex systems that we continually refine.

The Complex Unison Form is built first from what I call the Flocking Form. 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, forming tableaux for the dancers, revealing Kauffman's "order for free" as patterns emerge and dissolve over time. Simple Unison then develops into the Complex Unison Form to a point recognizable as Bak's "self-organized criticality"—where the patterns are endlessly complex and reside in the narrow region between order and chaos where conditions are in a prime state for change. There is a finely tuned balance between the new information of variation and the patterns that are holding the information together. Flocks of birds and schools of fish also exhibit these structuring principles of complex unison. Another component of this structuring form is Dr. Edelman's concept of "degeneracy": the ability to develop many different ways to get to the same outcome. The initiation and creation of many different gestural and rhythmic possibilities to create a recognizable complex unison is a key component to this form.

Dancers and musicians trained in Complex Unison recognize when these dynamical 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 an event that is created [spontaneously?] by

the dancers. The rules for that event need to be simple. The gestures need to be clear enough to be recognized and repeated. This form emerges through a process of continually [coming back/ reassembling?] to the event. The ensemble reconstructs this memory over time to investigate its hidden 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 to the success of Emergent Forms is that each individual musician or dancer needs to have 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. This represents the problem-solving aspect of the selection process that allows emergence to occur. They also have to have a very practiced sense of attention. Without it, they will distract and pull 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 patterns, and build on material. They also understand developing images based on time sequences. It is still a process of trial and error but 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 towards.

According to Terrence Deacon, a topology is a spatial-temporal relationship among component elements and their interactions with intrinsic causal consequences. Katie Martin, my research assistant and dance improviser, coined the term "metatopology" to describe the spatial-temporal experience of Emergent Improvisation. Her meaning encompasses the sensory awareness of many levels of attention happening simultaneously: self-awareness, awareness of local interactions, and global awareness of ensemble forms. Finally, there is the level of "detachment," where the human mind interprets meaning through the integration of all three levels. The fact that all levels are happening simultaneously, that the dancer/musician can move in and out of each level, or be aware of all four, contribute to a topology or a system where there are spaces of spaces of relationships.

Amplification, or pattern formation, 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 with highly sensitive selection capabilities can very quickly signal referential movements across large spaces through the use of repetition, unison, and rhythmic synchronicity.

An aspect of this work worth noting has been the close collaboration between dancers and musicians. The Black Music tradition gave rise to jazz and its improvisational elements greatly influenced modern dancers. In Emergent Improvisation, dancers and musicians are finding ways of structuring and creating forms together simultaneously within their own discipline and with the other.

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Emergent Improvisation as research, education, and as a practice for performance contains the following elements:

It is a process that is open-ended, not a closed system;

It is constantly seeking out, utilizing and being affected by change;

It displays a high degree of adaptability;

There is a heightened awareness of information in the present moment;

It is subject to the interplay of internal/external stimuli resulting in multi-leveled awareness and intentionality;

There is an emphasis on the interchange and interaction between the tension of integration of common language and forms, and the differentiation of movement vocabularies and individual initiations and intentions;

There is a drive towards coherence and the emergence of information and patterns;

It is a time-based discipline, where forms contain their own life-spans, where they assemble, dissolve and reassemble.

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The implications for 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/his own potential for expression and then negotiate that vocabulary in relationship with others in the environment. 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, into which I have found myself in the midst of explaining. The process of discovery has in itself been self-organizing, gathering strength with each new interaction, and becoming clearer as each new phase takes on a new form that prunes itself with more clarity and meaning.

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 a constant, ongoing process of selection combined with a certain kind of rigor amongst the dancers and musicians, certain forms might emerge that have a structural coherence or congruity that create an inherent essence or powerful sense of meaning or order that has a deep resonance for us on an aesthetic level.

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