

Radical Everything:

Mediating between our natural and built environments

Angela Chen

Master's Degree Candidate NYU ITP

721 Broadway, 4th Floor

New York, NY 10003

9909 477 1836

angela@s-p-r-a-w-l.com

ABSTRACT



Figure 1. Detail view of Radical Everything

The development of Radical Everything began from the premise that we understood our spatial surroundings more through intangible and invisible extrinsic forces rather than through means that were visible and physical. It is a proposed art installation that would be a means to provoke these insights, on a deeper, more emotional level and hopefully

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contribute towards a larger discussion as to how our actions can now affect and dynamically change the environment we live in rather than to be simply affected by it.

Standing at the intersection between nature, mechanical actuators, lighting arrays, and sensory detectors, Radical Everything incorporates these various overlaid systems towards the magnification and growth of emergent ecologies, begging us to consider both familiar and unfamiliar paradigms of behavior. At its core, the installation will foster the growth of crystalline structures as the byproduct of our inert behaviors. Through this interaction, we will begin to see how our physical bodies moving throughout a space can be the trigger that allows growth and new cycles to begin.

KEYWORDS

art installation, sculpture, emergence, morphology, phenomenology, crystals, behavior, modularity, ecosystem

1. INTRODUCTION

This project was part of my overarching desire this semester to explore these very intangible forces and the attempts to dissolve the boundaries between person and space. Through this exploration, I felt that we could begin to both better understand our behaviors and the space around us in order to not only see how these things are affecting each other but also how it is affecting our relationships with one another. Everyday our lives are full of the potential possibilities for thousands of these small interactions amongst each other to accumulate over time, and perhaps lead to bigger things, leading to the production of ideas, objects, work, play, and relationships. We have had life-long obsessions with the idea of how our environments shape us but less so about ideas of how we can re-enliven our spaces, injecting them with ever-changing life cycles.

2. BACKGROUND

2.1. Crystal Growth

As scientists, explorers, artists, architects, psychologists, and more, we have had a long history of looking to nature as the master programmer of interactions. And indeed it is nature's ability to absorb a multitude of forces and turn it into innumerable and intricate patterns that has made the crystal a paradigm of aesthetics and efficiency. The crystal can be viewed as one of nature's prime examples of this intricate complexity, whose space-packing tetrahedral system is studied and replicated for both its ever expanding variety of shapes and patterns as well as beauty.

The crystal attains this complex but orderly structure through a process of aggregation, in which incremental growth based on a minimum unit is complemented by a further series of units. The basic unit cell is made up of a specific fixed number of atoms of a certain type that is repeated in all three dimensions to form the crystal lattice.¹ And when these lattices are combined and repeated, they give rise to the ultimate formation in terms of a space-packing tessellation. This aggregation can be demonstrated with a model known as Diffusion Limited Aggregation or DLA.²

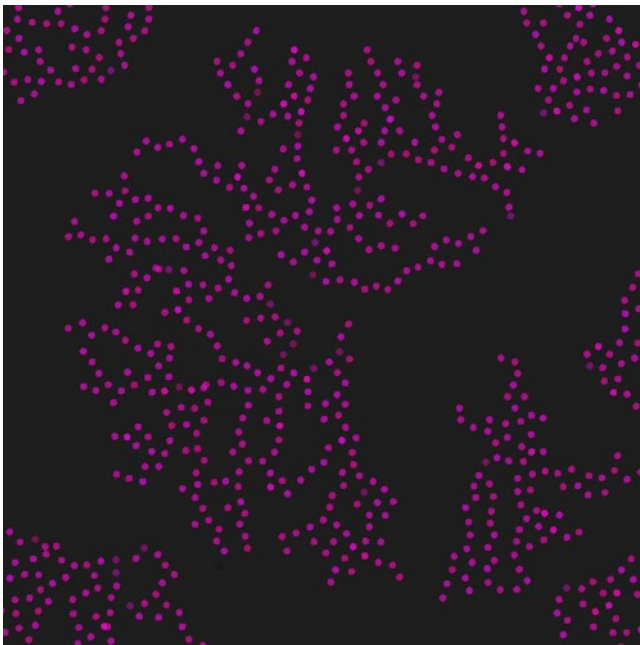


Figure 2. A DLA sketch created in processing modeling complex patterns emerging from a simple algorithm. As each particle collides with the initial seed, it will latch on and become part of the overall structure.

¹ Holden, 34.

² Schmidt, 1.

The crystal however, for all its intricacies and complex patterns is inherently static, and as such, has no behavior nor function. An emergent system on the other hand, can demonstrate the distinctive quality of growing smarter over time, responding to the specific and changing need of its environment. It rarely settles on a single shape, or pattern but forms patterns in time as well as space.

2.2 Emergence

These consistent patterns in both form and behavior can be found time and time again, from hurricane weather patterns to ant colonies, from traffic jams, to even the formation of city neighborhoods. Our everyday lives are full of the experiential variety that are the result of these open-ended processes which are not dictated by a top-down hierarchy.³ Contrary to one might assume, there is no lead bird directing flocks of birds on their migration path, nor is there a lead group of cellular organisms directing slime mold to move with means often times more efficient than most animals and humans. These behaviors are acknowledged as emergence, the notion of how a multiplicity of relatively simple interactions can give rise to complex systems and patterns.

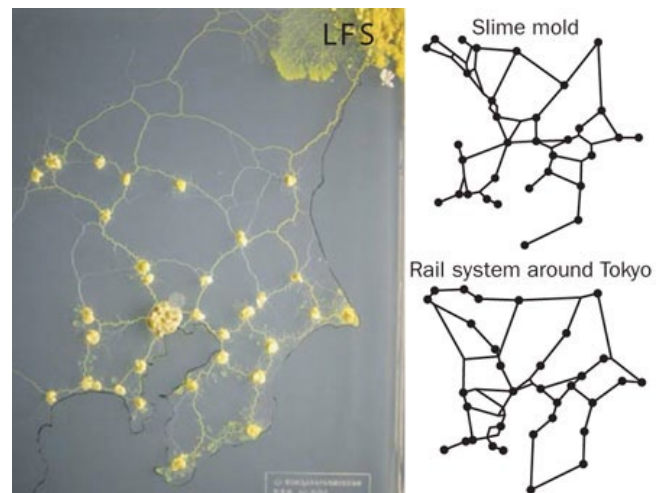


Figure 3. Slime mold connecting oat flakes like Japan's existing railway network

Increasingly we are looking to patterns of emergence for our own built environments. For example, railway designers in Tokyo, who no doubt have spent countless hours designing Japan's rail network to be the world's most efficient, is now looking to the slime mold's deployment as a pattern for refining their rail system to be more adaptable and efficient.

³ Johnson, 28.

Figure 3 shows how just over the span of 24 hours, by placing food sources on a map located at major cities, the slime mold is able to effectively create a network of distribution tunnels that is remarkably similar to Japan's existing rail network.

These patterns have also begun to transform the way we view our computational software and hardware.⁴ The transistor for example, which has transformed practically all modern electronics, is the device which allows each transistor to talk to 10 other transistors, and so forth. Yet on the nano-scale, nature does this even infinitely more complex. Within our own brain, we contain thousands of neurons with each neuron contacting 10,000 other neurons.⁵ This scale of complexity begs the question of how life really did emerge out of simple molecules as we have barely scratched the surface of an understanding of our human consciousness, which may very well stand as the most complex emergent phenomena of them all.

And while we may not be conscious of it ourselves, our own movements as we move throughout our own spaces, is consistent with this notion of emergence as we follow these simple rules of behavior.

Viewing the world through these decentralized interactions can be difficult for most people to accept, after all we live in a society where we have leaders governing the way we live our lives, although we should acknowledge that this centralized order tends to be a societal construct. People also may tend to side more with centralized interactions because we often view randomness negatively which is essential to any self-organizing system. People viewing patterns of emergence from the outside, can easily conclude that these patterns are generated from the idea of "seeds", seeds being things that are different from the rest of the system, like a broken down car causing a traffic-jam or a piece of food in an ant trajectory. In reality, a seed within a self-organizing system is really just a result of random fluctuations from which these patterns and structures grow.⁶ If you take for example, a stadium where a lot of people are clapping at the same time, random fluctuations exist that may cause a small

group of people to clap within the same rhythm, this same rhythm is multiplied exponentially, so that that whole stadium sometimes within seconds, is now clapping at the same tempo. Again, how does this happen? Emergence.⁷

3. CONCEPT

Radical Everything aims to be an on-going installation that mediates between our built environment and the natural one. As a collective whole, each of these modules drives several LED arrays and distributes a supersaturated crystal growing solution that stimulates and replicates active growth in an environment, embodying these once static patterns with dynamic behavior. It injects methods of instability, adaptation and movement into this process, and initializes action as a reactive nervous system.

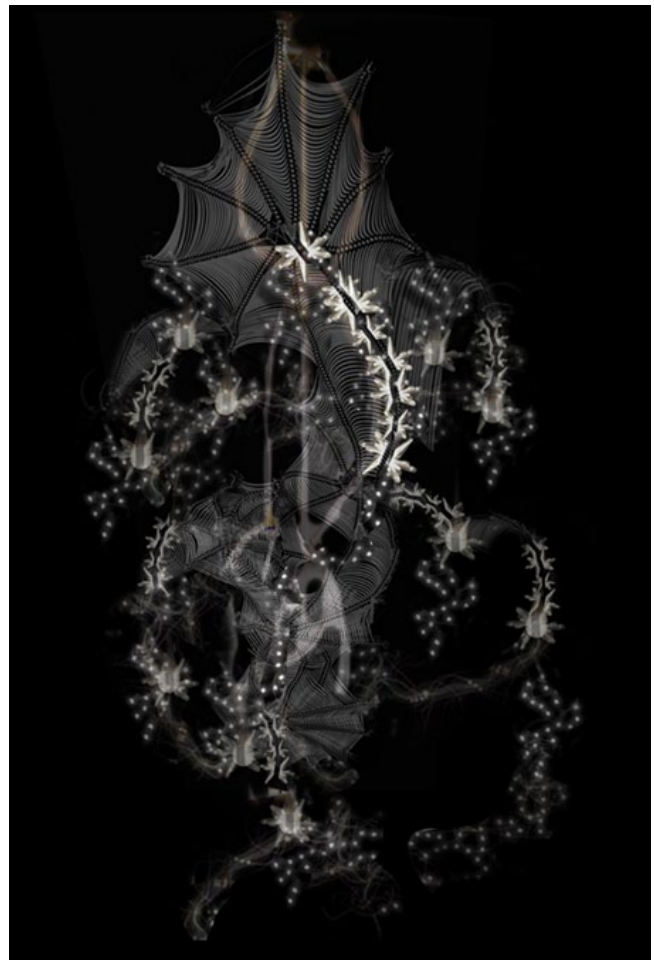


Figure 4. Rendering of one module for the installation

As we examine and define the space around us, we use sci-

4 Johnson, 48.

5 Ibid, 48.

6 Ibid., 52.

7 Ibid., 54.

ence as the means of testing our imagination, but we look to an artistic implementation as the link that can speak to our subconscious.

3.1 SCHEMATIC

Each module is an individual system that incorporates an array of sensory detectors, a lighting array, and a mechanical feed system, to produce as its output, crystals, through the distribution of a super-saturated crystal solution, whose growth is not only determined based on environmental conditions, air exposure and temperature, but is also now determined on thresholds of activity, both as a passing function of time and space.

3.1.1. Sensory Detectors

Starting at the top, there will be an array of sensors acting as agents upon the module, reacting to the proximity of people moving throughout the space and entering the hybrid field of the installation. Using four IR proximity sensors, it will translate the motion of people into ambient spatial patterns. Although the overall physical structure of the installation will be static, as a whole, this ecology can now become inherently dynamic. And as people move throughout the space, its presence within a space is both a product and result of their movements as well as dynamically shaping the environment and people's paths in which it occupies. Positive and negative feedback loops within the system, will help to self-regulate the installation. Positive feedback being ac-

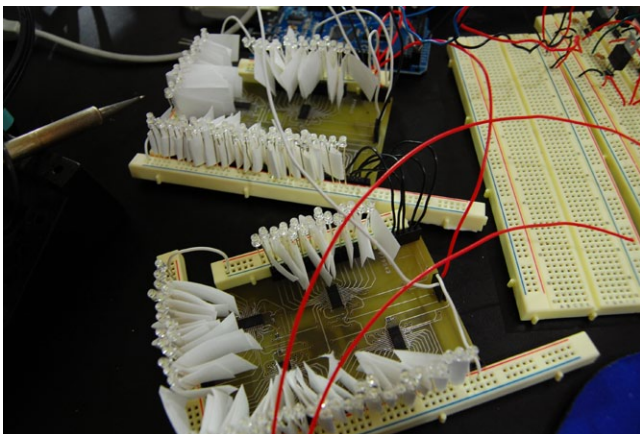


Figure 5. The TLC5940 LED Driver boards. Each board houses four TLC5940 drivers which controls 16 LEDs each, allowing the module to control up to 128 LEDs

tions that ramp up initial actions and negative feedback being ones that dial them down.

3.1.2 Lighting

People's presence moving throughout the space, triggers the sensors which in turn activates seed lights so that swarming behaviors in the lighting will concentrate around areas of activity. Therefore, the LEDs will be reacting on a more visceral, time-based pattern. Each hub of the lighting array are currently being driven by eight TLC5940 LED drivers. It is the eventual goal to develop a lighting pattern that evolves over time, creating more efficient generations of lighting patterns based on people's pathways, and yet also allowing for random mutations in the system.

3.1.3 Mechanical

With each generation of the lighting pattern, it will consequently affect the distribution of solution in the mechanical feed system. The mechanical system is essentially a gravity-feed system that acts as both a support and distribution structure for the module. It currently has three distribution junctions or nodes, each of which houses a solenoid valve, that will open or close its gates according to levels of activity.



Figure 6. A detailed view of the node which houses a junction split and a gravity-fed solenoid valve

Its arrangement is in a vein similar to that of our nervous systems, in which there is a main spinal cord extending from a control hub (in this case our sensors). The core distribution of liquid is dispersed through this main pathway which then branches off into other parts of the system. Thus the structure acts as both as a conduit for the liquid to flow as well as a conduit for the sensory information which is being directly acted upon it from above.

3.1.4 Growth

Finally this system will feed directly towards the crystal growing stations by distributing a supersaturated liquid. Supersaturated indicates the state in which the liquid con-

tains more dissolved solids than can be ordinarily be accommodated at a given temperature.⁸ Thus through a process of evaporation, the molecules will start to coalesce into its solid crystalline forms, inevitably creating a sense of wonderment at the way in which nature with or without us, creates perfection and efficiency out of randomness.



Figure 7. Results of a crystalline structure grown during the construction of this installation. This particular growth was over the span of a few days.

3.1.5 Construction

The actual construction of the module was carried out through a process of 3d-modeling in Rhino which were then extracted into each of the module's separate pieces. The pieces were laser cut at AMS and laid out in a manner that would create the most efficient use of the material bed area and material allowances.

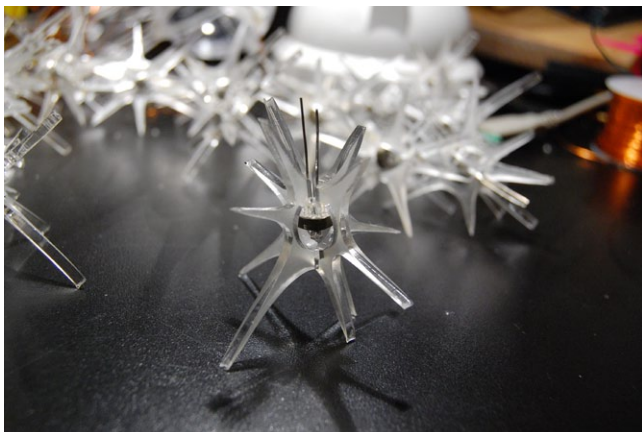


Figure 7. Laser cut component houses an LED



Figure 8. Finished construction

4. INFLUENCES

Standing at the intersection between art and science, Radical Everything's development has been influenced by the work of both researchers and practicing artists and architects alike.

4.1 Usman Haque

Usman Haque, a researcher and architect based in London, U.K. has been concerned with the issue of how to make architecture interactive, dynamic, and conversant. His work has stemmed from the research of early cybernetic research, in particular that of Gordon Pask. And his artistic exploration of these relationships can be seen through such projects such as Scents of Space and Burble.

4.2 Phillip Beesley

An architect based in Toronto, Ontario, Beesley's work in the last two decades has focused on field-oriented distributed sculpture and landscape installations. His installations question the imbalanced relationship of humans to our environ-

⁸ Holden, 16.

ment.

4.3 *The Living Architecture*

David Benjamin and Soo-in Yang of The Living, dedicate their practice to the integration of technologies into the built environment. Through research and experimentation such as the Amphibious Architecture project, they seek to promote the idea of living cities on a grassroots level.

4.4 *Steven Johnson*

Author of the book *Emergence: The Connected Lives of Ants, Brains, Cities and Software*, Johnson's research laid bare the notion of the link between nature, technology, and our own brains.

5. CONCLUSION

In our everyday lives, we face a constant barrage of complexity from the ordinary to the extraordinary, that we have learned to navigate without giving it further thought, nor wondered whether or not these occurrences could happen differently or from what larger experiential fabric they might take part. Other times, we find that the moments we traverse have happened so effortlessly we wonder whether or not there is some inert driving force that makes it so. Yet for whatever reason you may wish to call it, we have been given the gift of consciousness, an awareness of our actions. Philosopher and writer Alan Watts perhaps encapsulated it the best when he said, "Through our eyes, the universe is perceiving itself."⁹

So, although life might be easier if we could just follow some inert behavior and to always follow the flock, our decisions, for wherever they may take us, may lead us down different paths from those of our peers. Yet on a grander scale, our lives are still very much a part of the greater network of things in which we are everywhere immersed in our worlds, physically, intellectually and emotionally.¹⁰ The promise of technology can ultimately help our environments become better, more responsive and more dynamic,¹¹ yet we must also learn to radically examine our own personal worlds in new, deeper ways and to that end, the worlds of others. Only then can we begin to act as agents of change, each from our

⁹ Watts, 24.

¹⁰ Seamon, 1.

¹¹ Long, 56.

own respective backgrounds and experiences, towards the creation of new paradigms in a world that is multi-faceted, and at once concrete and mysterious.

6. ACKNOWLEDGMENTS

Thank you to Todd Holoubek, Eric Rosenthal, Clay Shirky, Kathy Wilson, Marina Zurkow, Dan Shiffman for their support and expertise as well as the innumerable advice received from fellow classmates.

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