

**Mason Cooley**

**Email:** [eucooley@gmail.com](mailto:eucooley@gmail.com)

**TDS 320: *Beautiful Networks***

**Term: Spring 08, Tue 8-1pm**

---

**Course Description:**

**A Whole System Approach**

*Beautiful Networks* is not your usual studio course. Instead of focusing on rigid guidelines and the end result, as we so often do in studio courses, we will pay attention to how different patterns of organization arise. We need to collaborate with living and nonliving systems in order for life on the planet to remain sustainable. Our life affirming creations are part of this process in a creative pragmatic way! Today there are big changes going on in the world and none of those changes involve just one aspect of the biosphere (e.g. cities, ants, the Internet, weather, our bodies and brains all share some of the very same “pattern of organization”). All of our lives are interconnected! This is something we know but not necessarily because we have been taught it. Our knowledge of the world comes from the actions and feelings we experience (or embody) as much as from reading books or what we see online. The importance of such connections is not simply what we do individually but how all systems and networks create a larger whole. To actualize many of these new concerns requires radical rethinking.

Many designers and artists are beginning to work with the whole system approach. I say this because many in their respective fields are inspired by natural form. This is no longer a metaphor but rather an actual process whereby solutions to complex problems already reside within living organisms and their environment. Biomimicry does not simply use nature to fix human made problems nor does it merely emulate the biological “look” of things. Instead we learn new processes from understanding the complex nature of living things and then apply those lessons in a sustainable and holistic fashion. As designers and artists we look into the living organization organisms share and understand how their systems change and adapt. Spider silk is now one example of this new approach: with its Kevlar strength and toughness many are using such models as more efficient and robust ways for creating sustainable and adaptable technologies. The point is humans have gotten very good at domestication for human needs. Today the issue is different. How do we fashion our creations to live alongside and participate in life's evolution? There may be no difference in the future between how a spider makes its silk and how we create our buildings because both share in the very same processes. In the end the web of life is mutually strengthening and sustainable (scale is a hurdle worth understanding in the new materials science of the next century). We now know that the patterns we see around us share deep connections to how form functions in nature. Humans have evolved to take large masses of material, break those materials down and use only a fraction of the original material, leaving then huge amounts of waste. Nature cannot afford to do this. Instead nature uses shape and form to give “information” or structure to matter. In other words, in nature “shape is synonymous with function.” This is how natural forms and processes occur in nature. At the *threshold* of energy resources is where self-assembly occurs!

What are systems and networks? A system is the *whole* of all interactions and how they interrelate in a specific environment (these include physical, biological and social relationships). Think of the system as “organized complexity.” The way we understand interaction in a system is by *network* models: connections then create networks. The network model is a *web*, which is to say, it is nonlinear and so it moves in all different directions at once. And the way we understand

the organization of the so-called “network model” is through the pattern it creates, in other words, the *pattern of organization* we experience. When these systems and networks are embodied in physical structures we see the pattern and organization they embody. This is the creaturely world we inhabit.

Some of the characteristics of such a self-making Autopoietic system is “it undergoes continual changes while preserving its web-like pattern of organization.” (Capra, 1996). In other words, “the entire network regulates and organizes itself.” (Capra, 1996). Examples of such autopoietic systems range from the Great Red Spot of Jupiter to the renewal of cells in your body. Each of these examples requires the system to create new elements inside it in order to maintain change and stability. For instance “one hundred thousand cells per minute” are replaced by our skin! “Our pancreas replaces most of its cells every twenty-four hours, the cells of our stomach lining are reproduced every three days, our white blood cells are renewed in ten days, and 98 percent of the protein in our brain is turned over in less than one month.” (Capra, 1996) So despite the regeneration of all our cells we go on living as though none of this is happening. Just as the ant colony gains a level of “swarm intelligence” that the individual ants do not have, our own lives emerge out of the complexity of living and dying cells, that taken individually, do not explain what our lives mean but together create a whole that is truly *more than the sum of the parts*. Another important feature to the systems and networks we will be studying is that each in their own unique way require matter-energy to flow through them, making them capable of creating new structures *inside* dynamically. Say for example we have a whirlpool of water forming a spiral. The vortex funnel of the whirlpool is nonliving but it has the dissipation of matter-energy still. Living systems also have the flow of matter-energy but in being autopoietic they not only self-organize but also regenerate themselves over time. Thus the environment is an important feature to how these systems develop over time and, despite the fact each autopoietic system is autonomous, they still embody their own place in the physical environment. Think of the environment as “triggering” the changes to occur in the system but not directing them to any particular outcome. Finally, living and nonliving systems tend to be either linear or nonlinear (for example, the biosphere is a living system but includes nonliving components that share in change and stability with living ones). If one moves a stone the rock behaves in a linear fashion, cause and effect are in a strict relationship. Newtonian mechanics applies to the rock where the same action with a living thing requires a very different understanding because the organism will respond according to its own structural nature thus making it behave in a nonlinear or unpredictable way. Let us summarize all this by saying “a living system is determined in different ways by its pattern of organization and its structure.” (Capra, 1996). Ultimately living and nonliving systems take part in a “global exchange network” which is the subject of this class.

Systems create “networks of pattern” and this is how we begin a more dynamic encounter with the physical, biological and social aspects of life. Amazingly the “pattern of organization” exists in all disciplines and in all kinds of living and nonliving phenomena. However, living systems tend to organize themselves with simple local level activity which over time collectively give rise to more complex “emergent properties,” that on a global level do not share the same qualities as those on the local level. In fact, such forms of pattern and organization occur spontaneously in nature (e.g. termite mounds and ant colonies; cities and traffic patterns; neural networks and the brain; flocking animals and their visual markings; bacterial and Internet communication networks; and even the shape of our galaxy). This means natural and cultural processes embody self-organization and over time express complexity of form. Life is self-generating which means order comes for free! It also means with the spontaneous creation of pattern there is no need for a single controlling factor, like a “command and control” center calling all the shots. In other words, as the pattern of organization occurs throughout nature, we see quite elegantly, how all systems interrelate and embody each other.

An example of this shift can be found in different animal documentaries: from a strictly human centered view (anthropocentric) animals struggle to survive through dueling (“survival of the fittest” and “natural selection”), where from the holistic view we tend more towards the pattern of self-organization (patterns we see in the visible world). Both views belong to a more immanent web that is constantly changing and profoundly indivisible. This means nature is open, self-sustaining and cooperative at the same time it is violent and unpredictable. What humans learn from this is that there need not be any contradiction between the two. Thus the systems view is not human centered but requires appreciation for all things as the “network of phenomena” is vast and too complex to be told in a single linear story. This is why the network or web is seen as nonlinear as its connections are multiple and spread across all nodes in the system. It also means such systems and networks exist directly in time and so are changing constantly. At their core then such systems embody different kinds of behavior, from the more predictable to the totally unpredictable.

To summarize: “Rather than seeing evolution as the result of random mutations and natural selection, we are beginning to recognize the creative unfolding of life in forms of ever-increasing diversity and complexity as an inherent characteristic of all living systems.” (Capra, 1996). According to the neo-Darwinist theory all “evolutionary variation” is the result of “random mutation” from “random genetic changes” followed then by natural selection. These reductionist concepts do not fit with the complexity we see in the natural world. Rather than reducing all of life's complexity to say genes or molecules we are beginning to see a more wild kind of process where “spontaneous order” and “emergent properties” are guided by their own immanent self-making and self-sustaining laws. In other words, in the systems view “evolutionary change is seen as the result of life's inherent tendency to create novelty” and “a self-organizing network capable of spontaneously producing new forms of order.” (Capra, 1996). This does not mean there isn't natural selection of some kind. However the systems view does state that evolution cannot just be caused by “random tinkering” but there must be some kind of emergent order from processes of selection in general. Nature does not widdle things down like we do in order to shape and make things (everything in nature is recycled so that waste becomes an integral part of sustaining the whole process). Nature invests in spontaneous forms of organization which are “wholes connected to wholes,” so rather than growing through a subtractive process (like when we extract minerals from the earth) nature puts information and structure into the very shape things take as novelty dictates the coevolution present in say the “subtle interplay of competition and cooperation, creation and mutual adaptation.” (Capra, 1996). It is “life's inherent tendency to create novelty” and not chance events that now suggest a world of ever increasing complexity and order. When scientists say organisms can no longer be viewed as passive receptacles for genetic mutation what they mean is that all kinds of morphogenetic processes are occurring in the organism that speak to spontaneous order rather than incremental change through random variation.

The so-called “system theory” is based on *wholeness* or organized wholes. Think of pattern as existing in time! Again, sometimes these systems are said to be “integrated systems” or are said to have “systemic properties” because they are interconnected, interdependent and exist directly in time. In other words, they evolve and go through changes of physical energy but they also go through changes of thought, feeling, movement and sensation (our “multiple unity of duration”). In short, nature's self-organization is sustainable and therefore people from various disciplines are discussing how complexity naturally exists in the world. They are also interested in understanding nature's complex relationships: order is an emergent property of chaos just as turbulence can occur in seemingly stable systems.

Our interest in this class is to generate a whole system approach when it comes to understanding all the different kinds of natural and cultural phenomena that we see and experience in the world around us, and how the “pattern of organization” creates a more open evolving relationship between design, science and art. In fact this is our only option for experiencing life’s full complexity, not to mention our own survival. People, services, information and energy all create an interdependent dynamic system of organic and inorganic relationships. In other words, our creative outcomes in this class will be the networked pattern of organization that we create and understand dynamically and systemically. This is why art, design and other creative forces are equally suited for taking science further, not as pure science but something more experiential, more whole! In other words, how the actual “shape of stuff” changes in the world.

This also means science by itself cannot understand life's full complexity, without life losing the very vivid qualities science seeks to understand. In other words, human experience is not reducible to a neuron or a synapse. Rather the new challenge is with *integration*. We may never locate a physical cause explaining the connection between synapses and our feelings. The fact is our everyday experience expresses the very things we are seeking answers to about life. What I mean is that design and art by their very nature are involved in the very same questions posed now by science. This means that despite our inability to experience the molecular universe we still have the experiential world which is the one all disciplines would like to understand but cannot reduce to their reductive models. This is the actual world we intimately experience but from within all the complex feelings of an ever changing whole! The new paradigm is one where our reductive models give way to creative experimentation with all kinds of new sustainable and generous forms (across disciplines and among diverse groups of people). This some argue could bridge the gap between understanding physical cause and personal experience. More importantly, all the various disciplines now realize there is a “deep ecology” to the kinds of new creations and thoughts that arise in the world, and those are located in the very things we already know but have yet to embody and understand directly. By and large we haven’t understood the whole in terms of the whole yet!

### **The Paradigm Shift**

We must not only rethink previous structures and our understanding of the world from a natural and cultural perspective but we have to learn new models for *integrating* all the various systems. Designers, scientists and artists share the same task now: to create different *lively* forms for understanding how different systems relate to one another and affect change in themselves and their environment. What should our systems look like? How can we use them intuitively and what new aesthetic are we talking about if our reductive models are no longer sufficient? There is no such thing as just a stand-alone computer, shoe or artwork anymore. All of these “things” belong to a *deeper* network that, depending on their internal behavior, may or may not be sustainable. For example, “The ‘fab’ of a basic memory chip, and running it for the typical life span of a computer, eats up eight hundred times the chip’s weight in fossil fuel” (Thackara, 2006). All disciplines are now required to work together, not for the design and execution of elaborate top-down hierarchical structures but direct and effective techniques for managing and creating new lateral outcomes that are more generous and flexible than previous ones. Again, instead of reducing complex relations to say DNA, RNA, genes, neurons or even atoms we must quickly begin a more time sensitive exploration into how different processes Relate, Communicate and ultimately Interact as embodied wholes! Instead of mechanically relating immutable objects to one another (the so called “clockwork universe”), we explore life’s holism and inside every “part” or node is the interdependence folded in *wholeness*. With the human genome we have the alphabet but lack the syntax or the understanding of how everything interacts and communicates (they say 95 percent of DNA may be used for “integrative activities”). Whether we look at the economy, human relationships or life in general they all point

to organized wholes. *The whole is more than the sum of its parts*: it is this *interaction* between things that makes the whole irreducible to its parts!

*Things function in an organismic web of organization!*

Indeed, it does matter how we look at everything since our own actions relate directly to issues of sustainability, quality of life and creativity in general. Once again, “Only 1 percent of material flows in the U.S. economy ends up in, and is still being used within, products six months after their sale.” (Thackara, 2006). More alarming still are the facts when it comes to the “hidden history” products have and their waste streams. How the so called “lightness” of new technologies create more wasteful and hazardous processes and materials. The faster and lighter we are the heavier our environmental load becomes. Even the fact that much of what we purchase is not adaptable and how many products aren’t used for more than a fraction of their total life span! How many cell phones, answering machines and remote controls have you owned at any given time? If we “use more people and less matter” then we might just realize how our consumer culture lacks wholeness and integration. America’s consumer economy is not sustainable. How could these things be integrated holistically and not require such massive carbon footprints? The same solutions to the same problems result in massive amounts of products and objects that ostensibly do the same thing. In fact they replicate the same problem over and over.

*We must learn to create adaptable strategies rather than the terror of planned obsolescence!*

Capra’s words are helpful: our paradigm is shifting from “mechanism to holism,” as he puts it, we are in the midst of integrating through wholeness and reaching beyond “dichotomies between substance (matter, structure and quantity) and form (pattern, order, quality).” The nonlinear web of interaction between things resonates and expresses deep aspects of the world. This is how we put ourselves back into the world rather than working the environment for short-term goals. Again, we now know the importance of seeing the relationships between things, no matter how strange or novel they are (“living systems nesting within other living systems”). Interaction in the system is qualitative change of the whole and not just the parts.

*The whole changes based on input at every scale: much of what we understand about the world is now visible to us as pattern!*

In short, what makes this class different from other studio classes is our emphasis on how the pattern of organization functions in diverse situations, making what we do in class a system, and so our outcomes will be group directed and open to unpredictable results. Instead of simply delivering specific products or objects we will understand the dynamics of different networks and the various outcomes they may or may not generate. In using local and global behavior it is important to model and generate new forms for the understanding and expression of how deeply complex these networks are. Yes, we will explore practical problems but our solutions will include more than just one outcome. Our efforts will result in a whole web of connection. In other words, our networked outcomes must be multiple and so creating more time sensitive models for understanding general and specific situations in the future, adapting but also applying those to novel conditions are all important aspects of complexity. No matter what job or practice one has in life a whole system approach can easily be adapted to fit the elements of that situation, so long as the potential for change and novelty are wholly explored.

For example, if we are concerned with environmental pollution in a project then the kind of information we Obtain, Interpret and Model may be different by the time we are asked to apply

what we have learned. This is why it is important to understand *internally* the system and network. This is so the process can be intuited later for the unique challenges at hand. Scaling old and new information is important but the environmental dynamics themselves are what require new models. Our group interaction will create, from the bottom-up, its own system and network that we can then adapt and change as new problems and conditions present themselves.

*This is what we mean by wholeness: complexity comes from interaction in the entire system more than the parts themselves!*

### **Projects and Group Learning (Brainstorming and “Mind Maps”)**

Self-directed group activities, research and networked studio projects will be our primary emphasis. Our systems approach will embody a wide range of communication. We will look at spontaneous forms of self-organization (e.g. ant colonies, bee hives, termite mounds, cities and brains) with simple and complex systems, included here are linear sequencing and nonlinear webbing. All these are approaches to understanding and experiencing the tenuous connections between order and chaos. Certain variables will be determined at the outset while other projects will incorporate randomness but with the realization that certain kinds of order do not preclude more turbulent or chaotic behavior (as I said earlier, order is sometimes an “emergent property” of chaos). Furthermore, some outcomes to projects may relate to multiple different contexts like scale and place.

Think of turbulence in a system as not something to avoid but adapt and move with. Sometimes the more turbulent environment requires less work and resistance on our part. *For example, fish in a turbulent stream harness energy in the water by letting the river work for them!* The collaborative-networked method of problem solving is inherently open and adaptable, meaning, we may not always know where we are headed but it is the group social dynamic that often lends itself to different results – in contrast with our individual concerns. Getting the group dynamic to do work for us entails a comprehensive approach based on trust, risk and creative problem solving. Examples like the fish are not just metaphors but share deep connections as systems embody one other. Imagine that order “floats in disorder” by the way water appears chaotic while on smaller and smaller scales those same “patterns of chaos” are actually highly organized, “vortices dividing and subdividing again and again” making it possible in living systems for order to arise out of turbulence or nonequilibrium. Thus “throughout the living world chaos is transformed into order.” (Capra, 1996). So between an ordered regime of frozen components and a completely out of control soup of chaos exists the place where life flourishes. This boundary region is very small and is called the “edge of chaos” because of the fluid dynamics it promotes. Many believe that the metabolic process is self-generating, meaning, we live on a very thin film between two nonliving states: the atmosphere and the earth's geology below. This means the biosphere is integral to life on earth but only extends down into the oceans about five or six miles and up into the atmosphere at roughly the same distance. It's a complex weaving of living and nonliving systems that make up the web or network. Life is not only self-generating but also self-perpetuating. In other words life emerged whole and remains whole! Like the tree 97 percent of it is actually dead, where life on earth exists on an area that, if it were a basketball, would be about the thickness of the paint! Thus cells, organisms, ecosystems and economic systems may all share some of the same laws of self-organization. Since all these are open to change the only way we can state their future is by recognizing that the process is *its own shortest description*. This means the system and network have to run their course in order for us to know what they might do in the future. Unpredictability is at the heart of the system!

### Neuroplasticity:

The brain is plastic! It's malleable, changeable and reorganizing. These are some of the features of a relatively new view about how the brain is not immutable after a certain age but remains in a plastic state all throughout life. In fact the brain is not only plastic but its structure changes according to learning and experience. In other words, as living creatures embodied in the world, we have the ability to alter our brain's organization. Thus mental processes enact physical changes in the brain as well as functional changes. Neuroplasticity talks about "neural nets" and "body maps" of a continually changing brain. Specific regions of the brain have the ability to reorganize, making one area take on activities that another area would have normally been doing. Brain plasticity is a practical and effective way of uniting mind, body and brain! Neurons that "fire together wire together," which basically means the synaptic interaction of neurons are "mutually strengthening," as they spread and create ever more resilient networks.

We will generally bring results from our research to class, work in groups and utilize "break-out sessions" to share and cross-cultivate ideas in a nonlinear fashion. All groups will be self-directed and students will engage in educating others through exercises, presentations and sharing of skills + knowledge. *This is a "strength-based" approach to learning.* Research will be self-directed and shared with others. The resilience of our projects comes, in part, from a rich body of information that every member will contribute to in their own unique way. Each so-called "emergent property" will change and require new definitions as the class evolves during the course of the term.

### About working in "socially cooperative" and "adaptable environments":

- ✓ Developmental approach: Observation, Transformation and Modeling. Our Materials, Methods and Ideas are integral to exploring bottom-up, collaborative and networked approaches
- ✓ Combining multiple media across disciplines, experiences and skills (showing by example, demos etc.)
- ✓ Experiential learning across individual and collective concerns
- ✓ Nonlinear models: Netmaps, mind mapping, brainstorming activities and associational webs, including brain plasticity and neural net models
- ✓ Multiple media both virtual and physical (inclusive online environment, 24/7 access and "keeping in touch")
- ✓ Developing "metacognitive" skills: social, physical and emotional intelligences (i.e. seeking, sieving and synthesizing)
- ✓ Distributed learning across communities of people and individuals: locality, people, serving a community and co-designed experiences ("Networked Generosity")
- ✓ Designing for the user and not the consumer! A new "service economy" where paying to use and not to own is the norm

### **Summary: Learning, Brains and Systems**

Here are some questions regarding the so-called integrated whole system approach. How do collectives sometimes work without rigid guidelines but still create resilient complex structures? What kinds of behavior do bottom-up, collaborative-networked approaches lend themselves to right now and in the future? What is the significance of randomness in both natural and cultural phenomena? How do questions like these insinuate holistic, nonlinear system approaches to methods of *Observation*, *Intervention*, *Transformation* and *Interpretation* of materials, forms and ideas? In other words, conditions that are physical, biological and social are integral to creating more viable and inclusive designs, especially when it comes to matching material dynamics and

forms with unique situations between people, the environment and all kinds of living and nonliving things.

*Our sensitivity is directed toward real-world outcomes while our forms and creations may span a vast territory between the practical, situational and concrete.*

There is a revolutionary tone to this class. This means we are in direct dialogue with the paradigm shift occurring now. This doesn't mean we tackle big problems alone as "rugged" individuals but help foster and create more lateral approaches, involving all kinds of talented people and processes. Whether we like it or not our "reductive methods" for attaining knowledge about the world in "parts" has more or less reached its end. Our new models say the world is a creaturely kind of place. We cannot stand apart from it but are embodied in it! Today we see a revisiting of how living things grow. Culture is the way nature evolved in humans. Organisms are not passive containers for genetic mutation. All kinds of complex processes arise in the living organism. How things grow into spontaneous yet ordered form is complex. The system we embody is not only the environment around us but also our own microbiology. Indeed the wild morphogenesis of living form is everywhere! Like I said spontaneous organization comes for free: life is self-assembling.

Furthermore, what is beautiful about holistic systems is their form making potential. The current paradigm shifters no longer sees themselves in control of the world but as collaborators in a dynamic whole, making the future open and wild. *Beauty is how we flourish in a world that we no longer know how to "represent" but experience from a more immanent place of action and creation.* Spontaneous organization is everywhere and it is our sensitivity as organisms and not just "human subjects" that will make this class a more creative adaptive process, instead of predictably returning to already resolved problems. We are not solitary individuals but social creatures embodied in the network of life!

In summary, Pattern, Structure and Process embody and share systemic properties, not only by way of *wholeness* but also through the organized complexity of life itself!

---

---

### **Course Learning Outcomes:**

- ✓ The student will learn about the "whole system approach" and its relevance to multiple disciplines from science, design and art
- ✓ The student will learn a general history of "system theory" and "complexity theory," including issues of sustainability and recent developments in brain science
- ✓ The student will take part in "cooperative and adaptable" group learning exercises (e.g. Nonlinear models: Netmaps, mind mapping, brainstorming activities and associational webs, including examples of brain plasticity and neural net models)
- ✓ The student will participate in field trips, visiting speakers and field research
- ✓ The student will be exposed to "metacognitive" skills: social, physical and emotional intelligences (i.e. seeking, sieving and synthesizing)
- ✓ The student will take part in self-directed group projects and create a co-designed experience
- ✓ The class will learn a "whole brain" developmental approach: Observation, Transformation and Modeling. Our Materials, Methods and Ideas are integral to exploring bottom-up, collaborative and networked approaches
- ✓ The class will be involved in distributed learning across communities of people and individuals. Combining multiple media across disciplines, experiences and skills

✓ The student will engage others through educating, collaborating and bringing new content to class: Relating, Communicating and Interacting

---

## **Weekly Schedule of Content, Projects and Exercises:**

Our projects will: First set the stage for aspirations of people, things and systems involved; Learn about the place, location and network in question; Sketch and model the story of the place, people and patterns; Locate “unity of processes” between findings and aspirations; Integrate and create feedback; Integrate real change and discuss the future.

✓ **Required Books:** *The Web of Life* (Capra, 1996), *Emergence: The Connected Lives of Ants, Brains, Cities and Software* (Johnson, 2002), *In the Bubble: Designing in a Complex World* (Thackara, 2006)

### **Week 1**

**Topics:** What is a system? / Define the networked “pattern of organization” / Simple to complex / Examples of systems living and not living / Choose an “object,” organization or phenomenon / Difference between “coordinate system,” networks and webs that change! / Open, collaborative and bottom-up

**Group brainstorm and self-directed groups:** Examples of living systems and their organizational pattern, examples of nonliving systems and their organizational pattern

**Individual Exercise:** Model the pattern of organization in a system / Locate networked relationships and interconnections / See differences and similarities between parts / Model internal and external dynamics / Interpret possible integration of devices and materials / Relate back to environment / Think of an example that is not a system! / Model the systemic properties of an object / What are the temporal elements?

**Results:** Visual presentation of findings / Relate information back to groups / Reconfigure existing findings into an integrated whole / Goal is to limit the number of redundant parts, objects or services / See what “emergent property” occurs (i.e. new shapes, forms and behaviors)

**Reading:** *In The Bubble* (Thackara, 2006), *The Web of Life* (Capra, 1996), *Emergence* (Johnson, 2002)

### **Week 2**

**Presentation and discussion of exercise**

### **Week 3**

**Topics:** Self-organization / Emergent properties / Ants, Bees and Termites / Cities and Human behavior / Open and closed systems / Bottom-up approaches / Randomness / Conservation / Cooperation / Integration / Structure as physical embodiment / Patterns do exist in time! / Feedback loops / Adaptive systems / Autopoiesis

**1<sup>st</sup> Project:** “**Burning Edge Cities: Making Tract Home Networks Sustainable and Integrated**”

**Details:** Wildfire prevention from land use perspective / Wildfire prevention from home owner perspective / Integrated prevention, construction, maintenance and regeneration as a whole system / Sustainability and community involvement / Changes to infrastructure, habits and behavior / Residents, products and adaptability / New buildings, products and community action / The wrinkled brain as model for fully integrated tract housing / “Less space more room” /

Mingling and parallel services / Talk is cheap! / Back to being a citizen not a consumer / Biodegradable everything!

**Field Research:** History of fire risk and management / Individual and community fire prevention / Inherent wildfire risks in planned communities / Reconfiguration of land use, infrastructure and alternative models of cohabitation in planned communities / Preparation for case studies / Visit, document and interpret specific locations / MIR project in New Orleans and The Rural Studio

**Reading:** *In The Bubble* (Thackara, 2006), *The Web of Life* (Capra, 1996), *Emergence* (Johnson, 2002)

#### Week 4

**Group brainstorm on 1<sup>st</sup> Project:** Each person relates findings to class / Locate pattern of organization / Locate “clusters” and refine areas of interest (e.g. dynamics of wildfires, environments like hillsides and tract housing, animals, master planning, risk to property, individual and community prevention, new products and innovations etc.) / Integrating already existing infrastructure?

**Self-directed groups:** Work in groups and share ideas / brainstorm and edit findings / Finish visual models / Refine and locate common threads

**Break-out sessions:** Relate, share findings and give models to other groups / Offer constructive criticism, skills and alternatives / Feedback

**Discussion:** Relate and integrate results

**Reading:** *In The Bubble* (Thackara, 2006), *The Web of Life* (Capra, 1996), *Emergence* (Johnson, 2002)

#### Week 5

##### **Presentation and discussion of 1<sup>st</sup> Project**

#### Week 6

**Topics:** City as “superorganism” / Local level activity and global phenomena / Agency, Volition and Intention / Nonlinear dynamics / “More is different” / Mobility of people and information / Scale and adaptation / Human social interaction / Synthesis / Holism and wholeness / Web of connection / Experience over substance / Meshwork structure: quantitative (extensive) and qualitative (intensive) / Gaia theory

##### **2<sup>ND</sup> Project: “LA as Superorganism: Walking as Generative Approach to Building Living Connections”**

**Details:** 3 Groups walking in three regions of Los Angeles / Eastside, Westside and SF Valley / 5 hour walk with digital cameras and notebooks / Groups walk in concentric circles / Slowness / Close-up images and long-shot images / Closeness and distance / Scale and interrelatedness / Small to large patterns (e.g. Analogue and digital communication; Human mobility; Logistics; Traffic; Crowds; Commerce; Weather; Air Traffic; Internet (Wi-Fi); Animals and Geology) / Upload imagery online / Create visual models / Temporal models / Is staying local possible?

**Field Research:** Document foot traffic / Geography and infrastructure like streets, sidewalks, alleys, parks, buildings, parking lots etc. / Link and relate different tools for interpreting the experience / Include all senses: Vision, Touch, Smell, Hearing and Taste / Mobility, atmosphere and thought

**Reading:** *In The Bubble* (Thackara, 2006), *The Web of Life* (Capra, 1996), *Emergence* (Johnson, 2002)

#### Week 7

**Group brainstorm on 2<sup>nd</sup> Project:** Groups bring visual models to class / How do the models relate to each other / Strategies for putting the three models together / How to present information

visually? / What kind of network is created? / How does LA look different in our projects from traditional maps? / What forms do we use to convey the *experience* and not the top-down view?

**Self-directed groups:** Work in original groups and share ideas / brainstorm and edit findings / Finish visual models / Refine and locate threads

**Break-out sessions:** Relate, share findings and give models to other groups / Offer constructive criticism, skills and alternatives / Feedback

**Discussion:** Relate and integrate results

**Reading:** *Biomimicry: Innovation Inspired by Nature* (Benyus, 1998)

## **Week 8**

### **Presentation and discussion of 2<sup>nd</sup> Project**

## **Week 9**

**Topics:** Neuroplasticity or brain plasticity / Whole-brain thinking / Somatic (Mind-body) / Neural networks / Embodiment / “the brain’s body map” / Cooperation and integration / Global patterns of the brain / Thought, feeling and sensation / Theories of consciousness / Meta-thinking / Mindfulness / Strength based learning / Social, physical and emotional intelligences / Pattern making / Connectionist / Biomimicry: solutions solved in nature’s context / Artificial intelligence / Swarm intelligence / Robotics and intuition / Neurogenesis / Bottom-up approaches in new technologies / Brain scans (PET and fMRI) / “Panprotopsychism?”

### **3<sup>rd</sup> Project: “The Brain, Embodied Learning and Nature’s Form”**

**Details:** Learning in humans and in nature / Environment and behavior / Small learning communities (LAUSD) / Alternative design models: schools, services and whole-brain experience / “Integrative design collaborative” / Embodied social interaction / Whole people and human agency / Designer as facilitator and collaborator / Themes: plasticity, elasticity, temporal change, material intelligences / Tacit knowing / Biology and design / Natural design and natural language / Innovation inspired from nature: the order to which things grow / Self-assembly / Learning from life / “Not slavish mimicry” / Morphogenesis not metaphor / Unity of brain, form and expression / Organization and noise as “mutually strengthening” / “Life adds information or structure to matter” / “Things disappear into systems” / Life’s well-adapted solutions: shape, form and function / Life’s systems are sustainable and exist in context to earth’s regeneration and novel growth

**Field Research:** Visit all locations of new LAUSD “small learning communities” / Listen and experience whole environments, whole places / Nature as model: “solar cell inspired by a leaf” / Learning from nature: emulation or *biomimicry* (e.g. “food, materials, energy, health, information, learning and business”) / Places of sustainability: natural and cultural / Integration not addition

**Reading:** *Biomimicry: Innovation Inspired by Nature* (Benyus, 1998)

## **Week 10**

**Group brainstorm on 3<sup>rd</sup> Project:** Bring together information and examples gathered / Find organizational patterns between disparate elements / What are the connections? / Discuss how learning, the brain and schools might be integrated around infrastructure, services and our experience / Discuss possible outcomes in biomimetic behavior / Hybrid forms / Morphogenesis / Biological growth / How do new models of the brain look? / Can we make a form that integrates Brain, Mind, Body, Environment *and* Learning, Growth, Regeneration and Action? / Looking at a problem from the person out and not the organization in / Personal habits as new design solutions / Empathy: “I feel what you feel, you feel what I feel”

**Self-directed groups:** Work in groups and share ideas / brainstorm and edit findings / Finish visual models / Refine and locate common threads

**Break-out sessions:** Relate, share findings and give models to other groups / Offer constructive criticism, skills and alternatives / Feedback

**Discussion:** Relate and integrate results

### Week 11

**Open forum:** What do we have and where do we go?

### Week 12

**Presentation and discussion of 3<sup>rd</sup> Project**

### Week 13

**Exercise and final presentation:** How can we represent this class as a System and Network?

**Discussion:** What pattern of development have we collectively created? What form should the model take? What information do we include? How is it represented visually? “Design mindfulness” between dialogue, community and people

### Week 14

**Final Presentation:** As a group we will present and discuss the results of the class as an open System and Network.

---

## Additional Bibliography and Websites:

Kauffman, Stuart. *At Home in the Universe*. New York: Oxford, 1995.

Briggs, John and Peat, F. David. *Turbulent Mirror*. New York: Harper & Row, 1989.

Hoffmeyer, Jesper. *Signs of Meaning*. Bloomington: Indiana University Press. 1996.

Wheeler, Wendy. *The Whole Creature*. London: Lawrence & Wishart. 2006.

Prigogine, Ilya and Stengers, Isabelle. *Order Out of Chaos*. New York: Bantam Books. 1984.

Varela, Thompson and Rosch. *The Embodied Mind*. Cambridge: MIT. 1991.

Livingston, Ira. *Between Science and Literature: An Introduction to Autopoetics*. Chicago: University of Illinois Press. 2006.

Whitehead, Alfred. *Adventures of Ideas* and *Science and the Modern World*. Both are Free Press. 1933/1925.

DeLanda, Manuel. *Intensive Science & Virtual Philosophy*. London: Continuum. 2002. \*His contributions in the Incorporations series (*Zone*) and *A Deleuzian Century?* (Duke) are two essays worth noting.

Bergson, Henri. *Creative Evolution*. New York: Dover. 1911.

Reiser + Umemoto. *Atlas of Novel Tectonics*. New York: Princeton Architectural Press. 2006.

Gleick, James. *Chaos*. New York: Penguin. 1987.

Grosz, Elizabeth. *The Nick of Time: Politics, Evolution, and the Untimely*. Durham and London: Duke University Press. 2004.

Dewey, John. *Art as Experience*. New York: Perigree. 1934.

Clark, Andy. *Being There*. Cambridge: MIT Press. 1998.

Boden, Margaret. *The Creative Mind: Myths and Mechanisms*. London: Routledge. 2003.

Goodwin, Brian. *How the Leopard Changed its Spots: The Evolution of Complexity*. New York: Princeton. 2001.

Williams, Raymond. *The Long Revolution*. New York: Columbia University Press. 1961.

Bertalanffy, Ludwig von. *General System Theory*. New York: George Braziller. 1968.

Hawken, Paul, Lovins, Amory and Lovins, L. Hunter. *Natural Capitalism*. New York: Back Bay Books. 1999.

Toffler, Alvin. *Future Shock*. New York: Random House. 1970.

Benyus, Janine M. *Biomimicry*. New York: Harper Perennial. 1997.

Schwartz, Jeffrey and Begley, Sharon. *The Mind & The Brain: Neuroplasticity and the Power of Mental Force*. New York: Harper Collins. 2002.

Thackara, John. *In the Bubble: Designing in a Complex World*. Cambridge: MIT. 2005.

Bateson, Gregory. *Mind and Nature*. New York: Dutton. 1979.

**Web links:**

<http://www.kurzweilai.net/index.html?flash=1>

<http://www.cnse.caltech.edu/index.html>

<http://www.santafe.edu/>

<http://www.ted.com/>

<http://www.bioneers.org/>

<http://www.worldchanging.com/>

<http://www.visualcomplexity.com/vc/>

<http://www.makeitrightnola.org/>

<http://cnx.org/>

Course Guidelines							
<b>Grading</b>							
<ol style="list-style-type: none"> <li>1. A grade and corresponding grade points are assigned after the completion of each class.</li> <li>2. The grade points are used to determine semester and cumulative grade point averages (cum GPA).</li> <li>3. The semester GPA indicates your academic progress for the semester.</li> <li>4. The cumulative GPA is an average of all semester GPAs and is used to determine scholarship eligibility, status and recommendation for degrees and honors.</li> <li>5. Please see the Student Handbook for additional guidelines.</li> </ol>							
<b>Grading Rubric</b>							
A	4.00 points	B	3.00 points	C	2.00 points	D	1.00 points
A-	3.75 points	B-	2.75 points	C-	1.75 points	D-	0.75 points
B+	3.50 points	C+	2.50 points	D+	1.50 points	F	0.00 points (Fail)
<p><b>A</b> 4.00 grade points — An “A” is a high honor grade that is reserved for exceptional students who have excelled in the production required for the class in either visual or written form. The work leaves little or no room for improvement. The structure is complete; the content is clear and substantial. In addition the student has participated actively and helpfully in class critiques. The student sees many sides of an issue, integrates ideas previously learned and anticipates the next steps in the progression of ideas. The “A” student is an example for others to follow.</p> <p><b>A-</b> 3.75 grade points</p> <p><b>B+</b> 3.50 grade points</p> <p><b>B</b> 3.00 grade points — <b>Minimum cumulative level of accomplishment required for graduation from the Graduate Studies Program.</b> A “B” is an honor grade that is given to students who demonstrate a solid understanding of the assignments given and have produced work of considerable achievement. The “B” student is an active listener, and accomplishes more than the minimum work required. The work is good and the focus is clear; however some areas though grasped, have not been used, developed or fully exploited. A “B” should be considered a high grade given to students of significant potential that have specific areas to be developed.</p> <p><b>B-</b> 2.75 grade points</p> <p><b>C+</b> 2.50 grade points — <b>Minimum cumulative level of accomplishment required for graduation from the Undergraduate Program at Art Center</b> A “C+” is an average grade that demonstrates a satisfactory comprehension of the subject. “C +” work accomplishes the all of requirements with basic competency and momentary flashes of insight.</p> <p><b>C</b> 2.00 grade points — A “C” is an average grade that demonstrates a satisfactory comprehension of the subject matter, accomplishes the minimum requirements, displays average initiative, communicates orally and in writing at an acceptable level, and generally has an acceptable understanding of all basic concepts. However, while there is understanding, the student has not yet found a way to make the material his or her own.</p> <p><b>C-</b> 1.75 grade points</p> <p><b>D+</b> 1.50 grade points</p> <p><b>D</b> 1.00 grade points — A “D” is a barely passing grade - the lowest grade possible for a delivered product. Although the student has met only the most basic requirements of the class, their work still qualifies them to progress to the next level of study/production. The work shows little understanding or connection with the material and is seriously flawed. At the discretion of the instructor, the “D” grade should be reserved for some extreme circumstance/disconnect from the standard grading matrix that allows a student to do so poorly and still pass the class.</p> <p><b>F</b> 0.00 grade points — An “F” is a failing grade that is given to students who have been absent from class 3 or more times and/or have not produced the work required. The quality and quantity of the work in and out of class is unacceptable. The work does not qualify the student to progress to a more advanced level.</p>							

<p><b>Attendance:</b> To complete a course successfully, you must attend all class sessions (unless you are engaged in research or location assignments that have been authorized in advance by the class instructor of the missed class). The instructor takes roll at the beginning of each class, and at the discretion of the instructor, three or more absences may result in a grade of F. If you miss a class due to illness, discuss the absence with the instructor at the next class meeting. If you are ill for a week or longer, please contact your department chair’s office and inform them of your absence.</p>
<p><b>Late Work:</b> (Faculty member determine their own procedures for late work)</p>
<p><b>Critique Procedures:</b> (Faculty member determine their own critique procedures)</p>

<p><b>ACCD Classroom Code of Conduct</b></p>
--

### Academic and Creative Honesty

**Plagiarism:** Plagiarism occurs when another person's idea, language or image is borrowed or stolen in its entirety and is not properly acknowledged. When presenting written materials, the words of another must be placed within quotation marks and a reference to the source provided. We assume that artists and designers commonly draw on other artists' work for reference or inspiration or to comment on those artists' work. We encourage this type of exploration. However, there is a fine line between "drawing inspiration" from a piece and making a literal copy. When a student represents a literal copy of another artist's work as his or her own, this is considered plagiarism. No student may disclose or exploit the ideas of another without that person's express written permission.

If it is determined that a violation did take place, the department chair or the Director of Writing shall inform the student about the academic sanction for the policy violation, which can range from a warning, assignment re-do, a grade of "F" for the assignment or a grade of "F" in the course. A further sanction may be to drop the student from the course immediately and/or dismissal or suspension from the College.

**Submission of same work in two courses without explicit permission to do so:** Presenting all or part of work done for one course in another course requires permission of the instructors of the involved courses.

**Unauthorized Collaboration:** In many course activities, other than examinations, collaboration is permitted and encouraged. Course syllabi and in-class instructions will usually identify situations where collaboration is prohibited, but the student shares responsibility for ascertaining whether collaboration is permitted.

**Cheating:** This is a very broad category encompassing a variety of forms of misrepresentation and fraud. Cheating is defined as accepting or giving aid to another during a written exam or for a written report unless authorized by the instructor, or accepting or giving aid to another for an individual studio project unless authorized by the instructor. This includes representing another person's work as one's own, or buying or selling written or visual work to be turned in for a class.

Cheating includes dependence on sources other than those specifically authorized by the instructor; possession of tests or other materials before such materials have been distributed by the instructor, unless prior permission is granted; failing to abide by the instructions of the instructor with respect to test-taking procedures. Examples include sharing exam answers, presenting work done by another as one's own, changing in any way work which may be reviewed in response to a grade reconsideration request, having a falsely identified person take an exam, or using notes, books and the like in closed-book examinations.

### Policy Against Harassment

The College is committed to providing a safe environment for teaching and learning. All of us must work together to maintain an environment that is free of unlawful discrimination and/or harassment. In keeping with this commitment, the College maintains a strict policy prohibiting unlawful harassment on campus, including sexual harassment and harassment based on race, sex, gender, color, national origin, age, ancestry, religion, sexual orientation, gender identity, marital status, physical or mental disability, medical condition, pregnancy, or any other characteristic protected by law. Harassment of another individual or group, by any student or employee (including faculty and staff), or by any third parties, such as vendors or visitors, is strictly prohibited.

If you have any questions about what constitutes harassing behavior, please bring such questions to the attention of Tracy Poon Tambascia (Dean of Students and Vice President of Student Affairs) or any other senior member of the administration or faculty.

*Please see the Student Handbook for additional guidelines on the above.*

### Accommodations for Students with Disabilities

Students who have a documented disability must meet with the Disability Services Coordinator, Shane Hart (ext. 2323), to review the documentation and discuss required accommodations BEFORE they are implemented in the classroom. Please do not request extra time on an assignment or exam, testing in a separate environment or any other accommodation without written communication from the Disability Services Coordinator to your instructor that such accommodations are appropriate. Centralizing the accommodations approval process insures consistency and fairness for all students with documented disabilities and removes the faculty from the position of having to verify difficult and often sensitive disability issues.

The full Disability Policy can be found at <http://www.artcenter.edu/accd/students/disability/disability.jsp>

