

VIEWPOINT

To Think as Nature Thinks

Optimizing Connectivity: Envisioning the University as a Complex Living System

by John J. Cimino, Jr.

Connectivity must become the first principle of our higher education universe.

INTRODUCTION: TO THINK AS NATURE THINKS

IN HIS SEMINAL WORK *Steps to an Ecology of Mind*, anthropologist, social scientist, and cyberneticist Gregory Bateson (1972) laid the groundwork for a new and broader understanding of mental process and in years to come would urge us all *to learn to think as Nature thinks*. To Bateson, Mind was a powerful descriptive of the all-encompassing mechanics of Nature, organizations, and human systems too. As one of the founders, together with Warren McCulloch, Norbert Wiener, and others, of cybernetics and systems thinking, Bateson saw mind and connectivity where others saw only sprawling diversity and disconnects. His insights shaped a generation of countercultural thinkers and pioneers of what today we call the science of complex living systems.

In his second groundbreaking volume *Mind and Nature: A Necessary Unity*, Bateson (1979, cover) laid out his prescription even more clearly: “Insofar as we are a mental process, to that same extent we must expect the natural world to show similar characteristics of mentality.” Biological evolution is a mental process. Conversely, our own conscious experience is a “selectional” process (Edelman 2006)—indeed, one of glorious complexity and staggering connectivity. We are creatures of this connectivity. We are connected to every life form on the planet, and our own mentality springs from the selectional processes of the

billions of synaptic interconnections of our very own neural ecologies. Ecologies within us, around us, everywhere.

To think as Nature thinks is, therefore, to think about “the pattern which connects” us to everything at every level. The pattern which “connects the crab to the lobster and the orchid to the primrose and all four of them to me.... And me to you,” as Bateson (1979, p. 8) was fond of saying.

And yet it is this question of *connectivity* that seems to have confounded us as educators for centuries. We’ve been experts at describing and defining at great length what a thing is and what it appears to be doing on its own, but have managed somehow and too often to avoid its place and function as a part of something larger. Our life sciences and ecological investigations have gradually overturned this perspective as simply poor science. Yet far too many of our great institutions still operate as collectives of silos and fiercely defended fiefdoms with meager connectivity among their constituent parts.

This is one of the principal challenges to institutions of higher education today.

THE CONNECTIVITY IMPERATIVE

There are few who would argue in principle against greater connectivity and enhanced integrative function within our institutions of higher learning. The virtues are essentially self-evident. Yet there are many who feel strapped into their disciplinary silos by the sheer depth of their specializations and the politics of an antiquated, very powerfully status quo environment. This presents a numbing paradox: the university is a veritable seedbed for innovative thinking, yet all too often its own structures inhibit innovation in the university master plan itself. Such institutions are swimming against the current and cannot do so indefinitely. The writing is on the wall, and the new high ground in higher education is clear.

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Interdisciplinarity and *transdisciplinarity* have emerged as a matter of historical necessity as our research interests have deepened and our strategies for examining our biggest challenges and most intransigent problems have reached farther and farther afield for new perspectives. Professor Einstein was pointing to exactly this when he observed, “The significant problems we face cannot be solved at the same level of thinking we were at when we created them.”¹

Author Franz Johansson (2004) has written popularly of what he calls “The Medici Effect” or the explosion of breakthrough insights to be found at the intersection of ideas, concepts, and cultures, the place where perspectives collide both by accident and serious purpose. We all know of the proliferation of such hybrid fields as astrobiology, biophysics, biopsychology, molecular genetics, and sociobiology where innovation has

emerged from the interstices, across differing perspectives, disciplines, and technologies.

Educator and president of the Carnegie Corporation of New York, Vartan Gregorian has long championed what he calls *knowledge integration* and the perspective of the generalist in contrast and counterbalance to a century of ever-increasing specialization (see, for example, Gregorian 2004). How does one inspire the broader perspective? Is deep knowledge in a single field prerequisite to sage and salient consideration of the wider view?

Architect, inventor, and polymath Buckminster Fuller gave us what today we call design science or design thinking via his heroic investigations of our inter-accommodating, inter-complementing, inter-transformative universe recorded in his miraculous volumes *Synergetics I* and *II* (Fuller 1975, 1979). As Fuller would say, “The first principle of universe is synergy.”

Our interconnected world makes this case for us every day. Without question, breakthrough knowledge emerging from our universities is giving birth to new industries at the crossroads of our traditional disciplines, greatly aided by the emergence of campus-based incubation and entrepreneurial centers. But breakthrough trends and innovation demands from outside the university are moving faster still (Homer-Dixon 2000), and a great many universities are playing catch-up without ever really catching up. Part of that is in the very nature of innovation—it leaps ahead of what most of us are able to see and takes us by surprise. That disequilibrium is healthy. It is only when we fail to adapt, to anticipate, and to drive innovation ourselves that we are left behind. This is the challenge of the moment. We know we need to move toward greater connectivity across our institutions, but can we get there quickly enough? Can we get past the roadblocks: the power politics of the status quo, the bureaucratic and structural impediments, the embedded system of rewards and coercions, the non-functional and the short-sighted? My purpose here is to draw attention preferentially to what I have

1 In *The New Quotable Einstein*, editor Alice Calaprice (2005) suggests that this quotation is a paraphrase of “A new type of thinking is essential if mankind is to survive and move toward higher levels” from the article “Atomic Education Urged by Einstein,” *New York Times*, May 25, 1946.

seen to be working, the experiments, the new starts, and the ideas still on the drawing board. The virtues of the day will be imagination, courage, and commitment, and I am keen to celebrate them.

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BUT FIRST A STORY, OR “HOW WE COME TO BELIEVE HOW THE WORLD WORKS”

When I was a boy of 12, I loved three things: baseball, my grandmother’s Italian cooking, and science, probably in that order. Every minute of every day that I could beg, borrow, or steal, I was outdoors with my Spalding high-bouncing ball and stickball bat (my mother’s broom handle) tossing the ball at a rectangle on any available brick wall (our strike zone), perfecting my curve and waiting for anyone else who would play with me. The neighborhood kids called this game “meatball,” and it usually led us straight up against dinnertime where my second favorite thing was on the menu more often than not. This was living high in our little Italian neighborhood. Imagine my thrill a half dozen years later when studying physics at Rensselaer Polytechnic Institute I learned that there was actually a mathematical function known as a “lasagna vector.” Surely this was a perfect universe!

But back to my 12-year-old worldview and the day everything changed. You see, there was this boy named Michael in the grade ahead of me at Our Lady of Libera School. He was kind of a loner and I really didn’t know him well, but one day he took me aside and asked if he could give me something. Before I knew it, he was showing me two LP records in their jackets and telling me he had to get rid of them. His mother had said, “Either they go, or you go.” So he had decided to give them away, and I could have one of them if I wanted. The covers had a picture of an old guy sitting at a piano, and in big letters they said, “ALEXANDER BRAILOWSKY PLAYS

CHOPIN.” One of the records featured 24 Waltzes, the other 24 Preludes. I pondered for a moment and said I’d take the Preludes. You see, I had no idea what a “prelude” was, and the word itself sounded kind of mysterious to me; *that* combined with the fact that both records were somehow “forbidden” assured my choice and sealed my fate forever.

I tucked my contraband into my schoolbag, buried it in my homework, and waited for a day when my parents and sister were out somewhere. Double-checking to be sure no one was around, I put the LP on our phonograph turntable, placed the needle carefully in the first groove.... Then, it happened. First, the hiss. Then, this astonishing, completely mesmerizing, and somehow instantly comprehensible music poured out and I could hardly believe what I was hearing. It seemed to go right into me and fill me up like a big glass of milk that never reached the top, and I couldn’t get enough of it. Day after day, I played it again and again, risking everything, even when my parents were around. I even played it on Saturday mornings, which all the kids in the neighborhood knew was sacred time for “meatball” on our street corner. But I couldn’t stop and I couldn’t explain it to anyone, especially my ball-playing buddies.

Then, one day, an idea came to me. What would happen if, as I was listening to the music, I also tried layering on my third-favorite thing? What would happen then? That third-favorite thing was none other than Einstein’s *The Evolution of Physics* that he wrote with Leopold Infeld. I approached the critical moment with quiet, barely controllable excitement and as scientifically as possible. Then—Voila! The words, ideas, and diagrams seemed to slip in right under the music like two streams one above the other rippling, gleaming, transparent, moving quickly and from time to time inverting their positions. The experience proved so immensely satisfying I felt as though I had just discovered radium or some other exotic new element, and I came to believe that this discovery was probably worth a Nobel Prize, but I wouldn’t tell anyone about it. To this day, some 50 years later, even the thought of

those Preludes brings back crystal clear images of Einstein's careful explanations.

A POWERFUL PEDAGOGICAL STRATEGY

Why this funny little story? You see, that ethereal and magical moment led me to believe two extraordinary things. First, that Chopin's music *was* magical, powerful, and personal beyond measure and, by extension, that all great classical music, even the music that I write today, has this inherent potential to reach transformatively into our very souls. And second, that music and science together defined a universe of experience so rich in dimension, so full to the brim with feeling and imagination, that maybe this double-dosing of disciplines is something worthy of a Nobel Prize. And not just for music and science, but for any pairing of disciplines. In the years to come, I explored other combinations: music and visual arts, music and philosophy, music and Nature, architecture, history, mathematics, human rights, leadership, creativity, resilience, strategy crafting—making connections at every turn. And of course, I am still learning, still exploring. My point is that double-dosing our disciplines and doubling up on our sensory channels became for me the foundation of an exciting pedagogical strategy for bringing ideas to life. My magical “moment in time” with Chopin and Einstein was *transformative* for me and the shaping of my thinking for years and decades to come.

Each of us needs the catalytic power of rich experiences and magical moments to set the stage for the emergence of our “take” on how the world works. Where will we find it? Will it be happenstance, a moment's inspiration, or a certain footfall in our journey through higher education? And when it comes, what inferences will it carry, what echo will it sound through the corridors of a curious mind? Will we dream of a connected world or a world of disconnects? Will the quality of our mental experience be opened to the more fully dimensional, more thoroughly malleable or collapse toward the perceptually flat? The dimensionality and connectivity of

our inner world is inevitably a strong predictor of the vitality and connectivity we're able to perceive in the outer world. “As a man is, so he Sees. As the Eye is formed, such are its Powers,” wrote William Blake (1799). We, as educators, are in the business of forming that inner “Eye.” The interplay of perception and belief, learning and experience is fundamental to our bailiwick. Belief informs perception; new perceptions, via learning and experience, inform belief. As educators we operate precisely at this nexus, and our curricula, our pedagogy, our systems and policies, and even the architecture of our campuses speak to the worldview, perceptions, and beliefs we bequeath to our students. If we would seed connectivity across campus, across the departments and the disciplines of knowledge, then some perceptible sense of that “pattern which connects” must be embedded in the university ethos, its landscape, and its DNA for students to discover in any chance footfall.

Gregory Bateson (1979, p. 69) called this creation of dimensionality and connectivity “double description” and considered it to be the basis of our formal process of explanation and knowledge formation. He likened double description to the experience of binocular vision where the view through a single lens or discipline yields a *monocular perception*, but a view through two lenses at once (the double-dosing of disciplines) generates the ever-surprising experience of visual depth of field or what I enjoy calling that sense of “in-depth” understanding so loved by our intellects. In my own experience, that 3-D depth of feeling and dimensionality, discovered through the juxtaposition of music and science, was powerful enough *to become* my personal reality, my individually authenticated sense of how the world worked.

Our universities need to be this place of catalysts, connectivity, and interdisciplinary double-dosing where students can construct their inner realities in a fashion as richly endowed with connectivity and dimensionality as is Nature herself. The truth of a student's inner “Eye” will, for better or worse,

always and infallibly inform the vision of her outer eye and the future she creates. That's what's at stake.

PROTOTYPES AND WINNING SOLUTIONS

CENTERS AND INSTITUTES

More and more colleges and universities have developed rich pockets of interdisciplinary and transdisciplinary student learning, thinking, and research. Many are called “centers” or “institutes,” and they vary in size, affiliation, and positioning within the university as a whole. A great many are themed to a hybrid direction of research, drawing on two or more core disciplines. Examples are the Max Planck Institute for Astrophysics, the Centre for Mathematics and Physics in the Life Sciences, and the Center for Studies in Music Technologies. Others are themed to social issues and to some of our most complex global challenges. Examples are the Belfer Center for Science and International Affairs, the Center for Climate and Energy Solutions, and the Center for Educational Informatics–Future Learning Systems.

Some larger-scale institutes have proven so effective in their interdisciplinary practices that they have been elevated as models for full-scale university transformation. I was fortunate to be called in to assist in the design and facilitation of the University Summit on Interdisciplinary Research and Education at the Beckman Institute for Advanced Science and Technology at the University of Illinois in Urbana. Conceived in 1983, the Beckman Institute is an interdisciplinary research institute devoted to leading-edge research in the physical sciences, computation, engineering, biology, behavior, cognition, and neuroscience. Through the University Summit, lead administrators, academicians, and researchers from across the university were given the opportunity to explore interdisciplinary approaches to teaching, learning, and research embedded in the Beckman model and to engage in open inquiry with Beckman's

program directors with an eye to the transformation of other university components.

REINVENTING MANAGEMENT EDUCATION.

It is well known that many business schools and university-based executive education centers have been in transition for the better part of a decade, merging their traditional MBA programs with elements drawn from the liberal arts curriculum. Ever since the *Harvard Business Review* and the *Wall Street Journal* published their declarations that the new MBA needed to be a liberal arts degree, business schools have been scurrying to catch up and find their way into this brave new world.

Three years ago, the United Nations convened its own summit of business school deans and directors from around the world, commissioning them to work together on the design of a wholly new model for management education matched to the new realities of the 21st century. Called the 50+20 Project, the effort drew its name from the 50 years since the origination of the traditional MBA model as created by the Ford and Carnegie Foundations and the 20 years since the last Earth Summit. Working over a period of a year and a half, I was privileged to collaborate with deans and directors from dozens of countries meeting in a series of conference working groups in New York City, St. Gallen, Switzerland, and Brussels, Belgium, ultimately delivering our new creation at the Earth Summit in Rio de Janeiro, Brazil. (To learn more about the 50+20 Project and “management education for the world,” see www.youtube.com/watch?v=-LgOd4BtSqE.)

CAMPUS-WIDE BIG CONVERSATIONS

A number of colleges and universities have instituted annual campus-wide discussions of major societal challenges and global issues, sometimes called “Big Conversations.” These conversations reach into virtually every classroom across the institution, into every department and every gathering space on the campus, connecting students with faculty and

administrators and with one another as never before. For the duration, the university becomes a genuine CENTER for real-time discourse, debate, and the expression and collision of ideas that matter.

KNOWLEDGE INTEGRATION IN THE FIRST-YEAR EXPERIENCE

Many colleges and universities have instituted “First-Year Experiences” specially structured to highlight the connectivity of knowledge across disciplines. With a design akin to Big Conversations, students are directed to focus their attention, critical thinking, and imaginations on a single work. In one instance with which I was personally associated, that work was Edward O. Wilson’s *The Diversity of Life*. Faculty across multiple departments guided first-year students in explorations of Wilson’s book through the discipline-specific lenses of their various fields: as literature, as science, as social commentary, as human values and ethics. This was a new and enriching experience for everyone. The biggest mind-openers, however, were those special open discussions where students heard their science professors praising the quality of Wilson’s writing and their lit professors weighing in on the side of Wilson’s perspective on planetary ecology! Boosting this interconnected worldview was the task assigned to me and my colleagues from Creative Leaps International. Our contribution was the performance and debriefing of a special Concert of Ideas entitled “If You Would Learn the Secrets of Nature,” which drew upon Wilson’s writing as well as that of his celebrated predecessors in the arts and sciences, Henry David Thoreau and Buckminster Fuller. Our alternating layers of music, science, and narration echoed the connectivity of the students’ classroom studies, which echoed the connectivity of the natural world and the interior worlds and brave messages of their supportive professors.

PUTTING CREATIVITY AT THE CENTER

Last among these examples is the Creativity Project at Oklahoma City University (OCU). This project originated with a challenge to OCU from the Priddy Foundation of Wichita Falls, Texas, to design a project that would put creativity at the center of the university’s learning culture. A number of proposals were forthcoming, but the one that won the day came jointly from the Fine Arts Institute and the Center for Excellence in Teaching and Learning. The proposal called for the recruitment and training of 12 faculty fellows each year from across the schools and departments of the university. The 12 would meet weekly among themselves and periodically with experts in the field to (a) take a deep dive into the nature of creativity and arts-based approaches to pedagogy and (b) design *new courses* in their respective fields grounded in creative activity and arts-based approaches to pedagogy that they would teach the following year. In addition, each graduating cadre of “Priddy fellows” would assist in the mentoring of the next year’s fellows throughout the five-year life of the project. I was lucky to be called in to advise the project and facilitate the development of the faculty fellows. After the initial year, the project went viral with extensions reaching into a dozen different components of the university, from student leadership development and young teacher formation to educational and community outreach. By the third year, students were mounting their own “creativity festivals” linked to socially conscious projects around the world.

THE UNIVERSITY AS A COMPLEX LIVING SYSTEM: A VISION

The emergence of an increasing number of programs, projects, and institutional initiatives directly or indirectly contributing to enhanced connectivity across today’s campuses is certainly encouraging. However, if we are to be successful in meeting the challenges of the next decade and the decades to come, the rate of emergence of these nodal

entities upon our institutional maps will need to increase significantly. I believe we are capable of that. As daunting as some of the obstacles may be, we need to set our sights on the thresholds of institutional change, i.e., the “tipping points” at which change cascades more rapidly through the system, proliferating ultimately in every niche and neighborhood of the new “fitness landscape.” Like Bucky Fuller’s synergy, *connectivity* must become the first principle of our higher education universe. Our capacity to plan this transformation *integratively* from present-day institutional cultures, structures, policies, and incentives will need to be driven—no surprise—by both imagination and a willingness to risk change. Have we made our peace with the risks involved: the risk of doing something new versus the risk of running in place? And, looking out over the field of *what is*, what do we see as *what can be*? What is our Mind’s Eye telling us about how the world works, and are we still wearing what William Blake (1794) called our “mind-forg’d manacles” constraining both what we see and what we can imagine?

We began this essay with an urging from anthropologist Gregory Bateson “to learn to think as Nature thinks” and a reminder of the glorious complexity and staggering connectivity of mental processes, both ours and Nature’s. With a nod to Professor Bateson, I would like to offer this corollary: “Insofar as *we* and *Nature* are mental processes, to that same extent we must expect our *universities* to show similar characteristics of mentality.” Take a minute to reflect on this. In other words, we should expect our universities to behave as fully functional, complex living systems and think and act from a level of interconnectivity approaching actual consciousness. This is a tall order, but great visions are always exactly that. They stretch us and inspire us and compel us forward. It is a path toward renaissance, a path we can travel both pragmatically and with high idealism.

I propose that we recognize and reward connectivity wherever we may find it, that we help make it visible and validate it as emblematic of our university’s future. I propose that we generate opportunities to sponsor and proliferate

all sorts of connectivity initiatives at multiple scales, but especially “pocket-sized” programs of diverse description, myriads of them engaging university stakeholders at every level, seeding a culture of connectivity accessible, visible, engaging, and full of meaning. Now imagine these pocket-sized initiatives as nodes on our institutional maps, the veritable *synapses* of our university’s mental processes. The more nodes, the greater the overall coherence; the more synapses, the greater the complexity of thought and capacity for self-awareness.

The thresholds to consciousness, to institutional coherence, to our *learning to think as nature thinks* are ideals that beckon us as leaders of our universities. We are already participating in the mindfulness that has set us on this trajectory. The “connected university” is a robust operational platform for both achieving institutionally coherent integrated planning and delivering on our mandate to grow, challenge, and inspire creative young minds. We must push forward with dedicated attentiveness, with courage and imagination.

This is our time.

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