



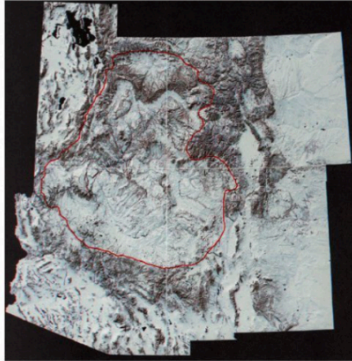
The Energy & Information Ecosystems of the Colorado Plateau: An Arts/Sciences Field Study

Richard Lowenberg

Richard Lowenberg, 1st-Mile Institute founding director, has spent nearly 50 years creatively integrating critical understandings and grounded involvements in non-profit organizational development, architecture, ecosystems design, rural community tele-network planning, theater, new media arts, photography, writing, teaching and grounded eco-social arts/sciences practices.

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Residencies + Research Collaborations + Exhibitions + Performances + Workshops + Education + Book + Web



"The Energy & Information Ecosystems of the Colorado Plateau: An Arts/Sciences Field Study" is a grounded environmental arts/sciences initiative, now being designed to complement other regional eco-research, cultural works and community decision-support processes, with collaborative residencies to inventory, map, assess and most creatively present enhanced understandings of the complex human and non-human 'energy and information ecosystems' of this four states region. This initiative emerges from a deep love of this most special place.

Introduction

"The Energy & Information Ecosystems of the Colorado Plateau: An Arts/Sciences

Field Study", being initiated as a project of 1st-Mile Institute's SARC Program, proposes to complement other regional research, resource studies, decision-support processes and cultural actions. Framed by creation of field-furthering, interdisciplinary, innovative arts/sciences collaborations, this multi-year project proposes to establish research think-and-do residencies, while cooperating with national parks, wilderness areas, tribal and rural communities, government agencies, educational and cultural institutions and many creative individuals, to inventory, map, assess, story-tell, exhibit, publish and most creatively present enhanced understandings of the complex human and non-human 'energy and information ecosystems' of the Four-Corner States Colorado Plateau.

At the creative, intellectual, educational and public communications heart of this project is the precept that while many of us espouse a need for improved ecological understandings and dedicated actions, few of us understand ecology as a dynamic, integrated whole systems science. Given the daunting complexity of our real-world condition, researchers, policy-makers, activists and the rest of us, usually think and work along narrow, single-issue paths (water, population, air, climate, land use, tech.), largely ignoring the intangible, immaterial nature and processes that physics generally refers to as 'energy and information'. The nodes and flows that bind and direct all matter, have no less significance than our more widely studied material ecosystems. We are now learning that understanding these mostly invisible forces makes all the

difference, if we are to act humanely and with nurturing care for our local-global selves and surrounds.

The arts and the sciences are each other's best friends; two sides of the same coin; a primary currency in the 21st century. They offer a convergent path to an eco-understanding of our world and our place therein. SARC is an onramp to that path forward, here to spark our imaginations, and to challenge our creative spirit and resolve. In this four state region, the convergent arts and sciences can be cornerstones of our economic and cultural future.

The Colorado Plateau

The Colorado Plateau is a roughly 130,000 square mile geo-physically described eco-region, within the Four-Corner states: Arizona, Colorado, New Mexico and Utah. Most of the area is drained by the Colorado River and its main tributaries: the Green, San Juan, and Little Colorado Rivers, plus the Rio Grande and its tributaries. This magical yet fragile place is one of the most extensively researched eco-regions in the world. Longtime home to many indigenous peoples, the region has the greatest concentration of National Parks, monuments + public lands in the U.S.

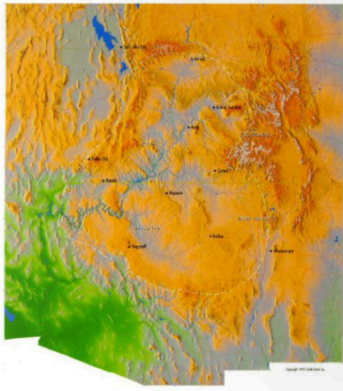
Its richness in energy resources is the basis for economic vitality plus contentious exploitation.

The Colorado Plateau has many stories to tell, some of which this initiative hopes to explore.

"We are at a transition point where we are questioning our disciplinary habits and looking for ways to integrate findings from numerous fields of knowledge. One possible solution is to encourage the fusion of the scientific and artistic imagination in education, civil society, and scientific institutions. By encouraging significant collaborations between scientists and artists, science becomes rooted in and more responsive to the new and emerging cultures that are actively developing new ways to reach out to the public. This will ultimately help insure that our institutions reflect our interdependence."

Andrea Polli, Ph.D, Mesa Del Sol Chair, Assoc. Prof., Fine Arts and Engineering, UNM





Grand Challenges

Our greatest local-global 'Grand Challenge' is to develop 'a unified ecological field theory', integrating physical, biological, environmental, information, social and economic processes, to move our understandings, intents and actions towards the most challenging, yet ultimately most important humane goals of our networked contemporary society: *'demosophia'* (*people wisdom*).

The Earth and all upon it, is bathed in, permeated by and all-involved in a universal flow and flux of electromagnetic radiated energy and information. We cannot address the critical issues of changing climate, water, energy, food, health, population, economics, politics or security, without a better understanding of our dynamically integrated matter-energy-information environment,

and of our need to think differently, by taking *"steps toward an ecology of mind"*.

"The Energy & Information Ecosystems of the Colorado Plateau: An Arts/Sciences Field Study" is a proposed multi-year project, intending to develop more creatively informed processes as basis for applied regional ecological understanding and decision-making. Information, like water, the air we breathe and community health, is considered an 'intangible and externality' by our dominant political-economic systems. Yet we should know that such immaterial 'common pool resources' are the true determinants of quality of life. The inter-dynamic states of matter, energy and of information are fundamental constituents of our evolutionary ecological existence.

This cross-disciplinary "Arts/Sciences Field Study" will take a scaled look at select energy and information ecosystems, from human social-scale telecommunications infrastructure and services (broadcast and broadband), to mapping and documenting the many coal, gas, oil, uranium, hydro, solar and wind energy sites, systems and distribution networks in the region. It will study and present the infrared signatures of diverse regional plants and other organisms, will record and analyze insect communications, will document atmospheric electro-phenomena, will sonify the quakings of the Earth, will compose new bird songs and will shine a creative light on the region's wealth of eco-cultural stories, languages, imaginations, dreams and world-views.

"The Energy & Information Ecosystems of the Colorado Plateau: An Arts/Sciences Field Study" is intended to augment other Four Corners regional ecosystem research, assessments, mappings, learning and decision-support initiatives, integrating emergent patterns for 'whole systems' interactions and interventions, with collaborative, highly creative processes and outcomes.

Arts/Sciences Residencies Proposal

1st-Mile Institute and its SARC (Scientists/Artists Research Collaborations) Initiative proposes the creation of an Arts/Sciences Residency and Research Program.

This project is intended to make a small difference; to propagate greater 'eco-mindedness' and an ecological world-view, with the Colorado Plateau as the richly inspiring eco-physical setting.

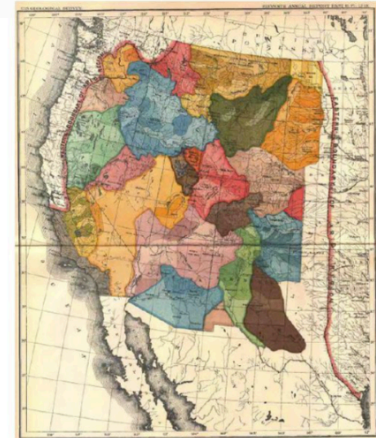
By its very nature, this ambitious project must attempt to be inclusive of the many communities, institutions, people and deeply motivated work and ways of the Colorado Plateau and surrounds. Partnerships and working relationships are being explored, joined and established.

The proposed Arts/Sciences Residency and Research Program will result in selected artists and scientists collaborations, interdisciplinary research studies, scientific papers/writings, geospatial mapping and modeling, site-specific performances, digital media stories and artworks, educational

outreach programs, museum exhibitions, a beautiful book and interactive web site.

An initial two-year period (2018 -2020) will be used to institutionally structure the program, apply for start-up and long-term program funding, nurture existing and establish new regional partnerships, create educational materials and best-practices and extend applied ecosystems understandings to improve regional economic, cultural and social processes and outcomes.

"For too long we've been looking at each of these problems in isolation, or at most, trying to understand how two systems interact with one another. The historical structure of research reflects a belief in restricted, 'disciplinary solutions.' But times, they are a-changing. What we need to investigate now is how multiple





systems evolve and adapt in response to one another, and explore the common properties of these systems.”

“It all sounds highly improbable until you realize that it is not that large problems are intractable, but that they require audacious imagination, a willingness to take risks, convening the right groups of collaborators, and asking very challenging and seemingly far-out questions. After all, who would have suspected that there could be such things as space-time, quantum entanglement, Turing machines, and natural selection? These are wonders of the imagination that also facilitate interactions with our environments.”

David Krakauer, President, Santa Fe Institute, 2015

Information, be it embodied in organisms, the mind, or the culture, is part of a larger selective system that determines through successful competition or cooperation what information survives. Information

can be encoded in genes, nerve nets, or institutions, but the selective system that promotes survival remains similar. A selective system is a pattern producing and recognizing system, be it the pattern of life on earth, the symbolic order of the mind, or the pattern of culture. A selective system manages complexity. ...

Heinz Pagels, *The Dreams of Reason*

Potential Four-State Artist Invitees

The Colorado Plateau has long attracted creative individuals, and this four-state region is home to many artists of all disciplines, including some remarkable creators already deeply involved in interdisciplinary, eco-minded art/science practices, as writers, poets, performers, musicians, new media makers, land artists, photographers, conceptualists and more. An extensive pool of such artists from the four states will be developed for arts/sciences residencies, collaborations and presentations, as programs become formalized.

Towards an Ecological Understanding of the Energy-Information Environment

When speaking of ‘the environment’, most people still think only of the tangible, physical environment of air, earth, fire, water and life. But these material systems

“Just as the physical environment determines what the source of food and exertions of labor shall be, the information environment gives specific direction to the kinds of ideas, social attitudes, definitions of knowledge and intellectual capacities that will emerge.... When there occurs a radical shift in the structure of that environment, this must be followed by changes in social organization, intellectual predispositions and a sense of what is real and valuable....

We might say that the most potent revolutionaries are those people who invent new media of communication, although typically they are not aware of what they are doing.”

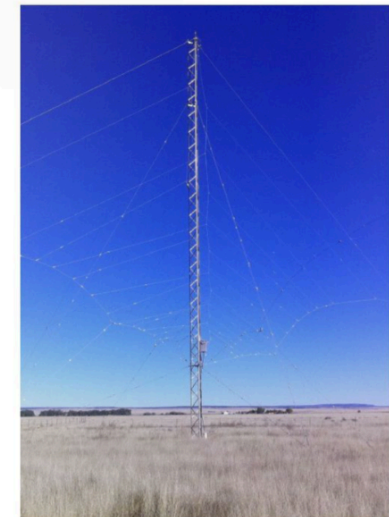
Neil Postman



The Nature of Information

“Complex systems in nature and society make use of information for the development of their internal organization and the control of their functional mechanisms. Alongside technical aspects of storing, transmitting and processing information, the various semantic aspects of information, such as meaning, sense, reference and function, play a decisive part in the analysis of such systems.”

Bernd-Olaf Küppers, Professor Emeritus of Natural Philosophy, University of Jena, Germany, author, *Information and the Origins of Life*, MIT Press, 1990



Information Ecology
The Nature of Information

Information, like matter and energy, is a primary ecological constituent.

Information requires life, and it endows life.

Information is universal, with qualities and properties varying according to scale.

Information is the difference in a state of being resulting from any interaction, macro to micro, between two or more systems.

Information at human-earth scale may be thought of as constituting a complex dynamic environment, with which all of life interacts.

The dynamic flow of information tends to reorganize all living systems and social constructs.

The human brain and nervous system have evolved through cumulative genetically coded experience, unique self-referencing processes, and a seeming tendency to be all knowing.

Human senses evolved to sense narrow visible and auditory ranges of spectral information, though we invisibly and intangibly continually interact with all information.

Human technological developments, as sensory aids, allow us to tune in to, ride upon and manipulate large parts of the information environment.

Information has value. It may be free, cheap or expensive, based on its availability and demand, processing requirements, and ability to make a difference.

In human terms, pollution and waste in the information environment are qualitative: ignorance, confusion, deception; as well as quantitative: sensory overload and high noise to signal ratio.

Information is a verb, not a noun.

are bound together in an emergent flow of sustaining energy and information; the Earth-Sun-Universe connection. It is this thermodynamic life force, this radiant electromagnetic environment, and its impacts on the human body and mind, and on all life, to which a sense of ecology must be acknowledged.

We have long known that the environment is much more, with contemporary physics and ecosystems sciences showing that 'the environment' exists in the elementary, complex, inter-dynamic and co-evolutionary states of matter, energy and information. While we understand a great deal about material ecosystems, and are now including entropy and energy flows in our equations, we have barely applied understandings of ecology to information, and therefore to an integrated, whole-systems understanding of ecology. This will have evermore troubling consequences as local-global societies increasingly tune into, develop, pollute, manipulate and live in the information environment.

Human use and manipulation of the electromagnetic spectrum for communications, and the production and evermore saturating flow of energy for power, are having direct effect upon all living organisms, in ways barely understood. This energy-information environment; the flows and concentrations of cause and effect in this invisible, dynamic ecosystem; and the symbiotic relationship between the production of communications technology, with the co-evolution of

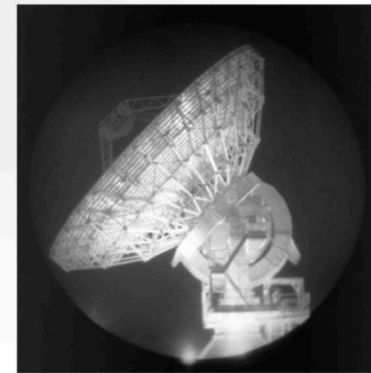
the human psycho-sensory system, is considered too esoteric and unfathomable a subject for most people to involve themselves in. Nonetheless, it is becoming clear that energy-information processes determine the dynamic course of social evolution.

The overpowering chaos of the universe is miraculously awesome. The continuous, delicate balancing act between order and disorder involves us entirely, from molecule to mind. High entropy (chaos) matter-energy displays resistance and inflexibility. It is the quality of low entropy (order) that makes matter-energy receptive to the imprint of human knowledge and purpose. We can neither create nor destroy matter, energy or information. We live on the qualitative difference between these natural resources and waste; the increase in entropy. High entropy; noise in the information environment, is constituted by ignorance, confusion, deception and obfuscation. To ignore the simple and elemental truths of the Entropy Law, is undoubtedly to promote more undesired disorder over time.

Life's delicate balance requires greater sensitivity and perception. An ecology of the information environment; 'an ecology of mind'; would foster intelligence, creativity and inspiration as our most valued resources. Within this conceptual framework, the arts, sciences and lifelong learning in pursuit of truth and beauty, ought to be the ultimate exemplars of a culturally rich, sustainable society. This would be a real Information Revolution.

Colorado Plateau Mapping

An historically major element and mode of arts/sciences integration, now rich with relational digital data, is mapping and modeling. How do we map intangible and invisible dynamics over time?



At the short end are the gamma waves, so tightly packed that a billion strung together would barely cover a fingernail. At the other end of the electromagnetic spectrum are enormously long waves. Most waves are measured in cycles per second, but these are so huge that they take more than a second to pass by, which makes them more than 186,000 miles long, or more than twenty times the diameter of the Earth. There are indications of some waves as much as forty seconds, or seven million miles in length. At the moment we cannot begin to guess at the significance of these signals. All we can do is record that they exist, that they traverse galaxies, that despite their very low field strength, life is sensitive to them.

See more at 1st-mile.org



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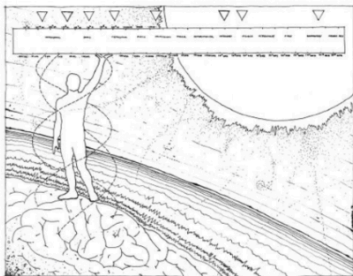
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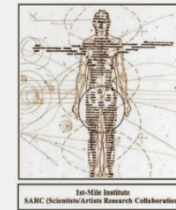
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1st-Mile Institute

1st-Mile Institute, founded in Santa Fe in 2006, is a think-and-do-tank currently stewarding two programs: The New Mexico "Broadband for All" Initiative, and SARC (Scientists/Artists Research Collaborations).

SARC (Scientists/Artists Research Collaborations)

SARC (Scientists/Artists Research Collaborations), was successfully piloted as a featured program of ISEA2012, and is now structuring long-term eco-cultural initiatives. Initial education, science research, cultural institutions and supporters have included the New Mexico Consortium, Los Alamos and Sandia National Laboratories, University of New Mexico, Santa Fe Institute, Institute of American Indian Arts, Santa Fe Center for Contemporary Art, Santa Fe Art Institute, and City of Santa Fe. SARC has produced 'Arts/Sciences' programs for the CURRENTS: International New Media Festival, annually since 2012.

While developing its regional cultural and educational initiatives, SARC is also participating in networked national and global interactions. SARC is co-producer, with Cabine Voltaire (NL), of an online Google Hangout series on Astro-Arts/Sciences. Invited SARC presentations were given at the XVIII ISA World Congress of Sociology, "Facing an Unequal World: Challenges for Global Society", July 2014, Yokohama, Japan, and at Balance/Unbalance, at ASU, Tempe, AZ, March 2015. SARC collaborated on and is featured in "Steps to an Ecology of Networked Knowledge and Innovation: Enabling New Forms of Collaboration among Sciences, Engineering, Arts, and Design", a 2015 Leonardo MIT Press Ebook.

"ECOS"

The SARC "ECOS" initiative is being structured upon intent to address local-global "Grand Challenge" issues of climate, communications, energy, information, ecology and economics, with greater eco-minded intelligence, creativity, multi-sector cooperation and sustaining outcomes. "ECOS" seeks eco-cultural co-conspirators.