SARC (Scientists/Artists Research Collaborations)

SEAD White Paper

By Jack Ox and Richard Lowenberg

Disclaimer Note: *The SARC Summer 2012 pilot initiative accomplished many intended objective outcomes, garnered partners and served as the impetus for program next phase development. There is currently no pragmatic reality to SARC's ongoing programmatic life and works, though. This White Paper, therefore, lays out SARC resources, structural considerations and intentions. At this point, SARC reality and creative potential is being dedicatedly developed, but uncertain. It is from the grounded reality of SARC development that we will form some action points.*

Introduction

Most of society, and even many of us who think about these issues, do not fully recognize or understand the processes and potential of what we are calling SEAD; and in not understanding we undermine this potential. The convergence of the arts with design, engineering, science, education and many other human endeavors and social trends, is proliferating everywhere around us. Creativity across and beyond self-limiting disciplines is a natural evolutionary tendency in all of us, nurtured today by the opportune-rich emergence of greater social freedoms, openness and democratization. This includes technological development, understood as part of our sensate tuning-in to a wondrous information ecosystem, adding to our new real-life worldviews.

Creativity in this context is being driven by a perceived need to *think different*; to apply new, complex yet holistic understandings to critically troubling issues facing our world and ourselves. SEAD requires honest, open-mindedness. It should not fall into the trap of *old way* categorizations, academic curricula and evaluative measurements, but should rather be understood as a social movement; an evolutionary response to our mysterious humane journey.

SARC is a new initiative that intends to develop and set grounded examples for an eco-social understanding of SEAD, aspiring to create and further highest level achievements and valued benefits. We intend to frame SARC initiatives by asking some of the most important, difficult questions of our time, and by telling inspiring stories, under the project code name "ECOS". SARC has lofty ambitions, because we feel that it is necessary to work at appropriate scale and effect. We are just getting started. We have no assurance of success. It will not be easy.

SARC Summer 2012

The Scientists/Artists Research Collaborations (SARC) initiative was piloted during Summer 2012 as a project of 516 ARTS, for ISEA2012 (International Symposium on Electronic Art) www.isea2012.org, just held in Albuquerque, Los Alamos and Santa Fe in late September.

SARC Pilot Co-Directors:

- Jack Ox, Associate Research Professor, Music, UNM jackox@comcast.net
- Richard Lowenberg, Art and Science Laboratory / SARC richard@artscilab.com

SARC research institution partners to date are the Los Alamos and Sandia National Laboratories, with the collaboration of University of New Mexico's Center for Advanced Research Computing (CARC) and Santa Fe Institute.

SARC has been funded to date by Lockheed Martin/Sandia National Laboratories and the New Mexico Consortium, with additional supporting company sponsors: Los Alamos National Bank, CenturyLink/Qwest Communications and Qforma.

Five SARC artist collaborators were selected from over 75 applicants for the ISEA2012 Summer pilot:

- Ruth West, UCSD Center for Research in Computing and the Arts (CRCA), San Diego.
- Francesca Samsel, working w/ visualization labs at UT El Paso and UT Austin, TX.
- William Ray Wilson, (Navajo) Institute of American Indian Arts, Santa Fe, NM.
- Adrianne Wortzel, New York City College of Technology, City University of New York.
- Todd Ingalls, Grad. Studies Chair, Arts, Media, Engineering School, ASU, Tempe, AZ.

"I'm interested in developing new modes of inquiry that bridge art and science in order to go beyond what we can already *see* and *know* through the training and technologies we possess. Working across disciplines with researchers in the sciences, I can develop research with hybrid outcomes that contribute new knowledge as well as public-facing experiences that bring complex science to general audiences."

Ruth West, Strategist at the Center for Research in Computing and the Arts at the University of California San Diego. SARC artist and advisor.

SARC co-directors and artists initiated preliminary interactions and discussions on-site and remotely during the Summer, with a July visit and follow-on communications with science research teams at Los Alamos and Sandia National Labs, Santa Fe Institute and UNM. In this first phase, the SARC artists and science research teams brought up shared interest and experience in cross-disciplinary work with large data sets, complex eco-systems modeling and applications, food and health issues, advanced visualization and sonification techniques, cognition, memory and perception studies, and creative talents applied to critical social and environmental understandings, decision-making processes and problem solving.

SARC did not contrive to immediately pair up an individual scientist with an artist; nor did it simply expect pre-proposed projects to be the basis for collaboration. It instead intends that groups of artists and scientists begin to communicate among each other, to meet in scheduled site visits and begin to have in-depth discussions about the nature of art-science collaborations; about the potential extents and limitations of what may reasonably be accomplished through initial interactions; and about areas of joint research which may emerge, and may be considered for ongoing collaboration and support. Rapport among individuals, funding, and researchers' allocation of time were understood to be among essential collaborative determinants.

The SARC Summer pilot program resulted in the following outcomes, deliverables and ongoing efforts, beginning with July artists and scientists meetings, interactions and presentations.

- Fri., July 6: SARC initiated its commitment to education and public outreach with a special "3D-VIS" presentation, featuring the latest active 3D visualizations produced by LANL and Sandia teams, as a special program of the Currents: Santa Fe International New Media Festival.

- July 9 and July 11: SARC artists had arranged presentations/discussions with potentially interested science researchers a Sandia Labs/CERL and at LANL. During July, artists and guests given security passes, also toured the 'restricted' *Vault* behind the fence at LANL, to see demonstrations of active 3D visualization facilities: the CAVE (La Cueva) and the Powerwall, with presentations of nano-structures, asteroid impacts, explosion dynamics and ribosome structures. Scheduled meetings with LANL researchers were held in conferencing/workspaces provided at the New Mexico Consortium.

"Cross-disciplinary collaboration is essential to 21st century science, engineering, and biomedicine, and is deeply integrated into the fabric of supercomputing at UNM. SARC will continue CARC's tradition of collaboration at the nexus of art, science, and technology. We believe that the greatest insights and advances will result from unexpected encounters among creative researchers who are willing to take the leap and reach beyond the strict confines of their fields."

Susan R. Atlas, Ph.D., Physicist, Director of the UNM Center for Advanced Research Computing (CARC), and a theoretical scientist leading research groups in nano-science and computational cancer biology.

From September 15 through 25, SARC conducted three public panels/presentations and a private, invitational Working Group meeting at Santa Fe Institute, in conjunction with ISEA2012.

- Saturday, September 15, 1:00-5:00 p.m.: ISEA2012: "Art & Science: a presentation at the Bradbury Museum in Los Alamos, a featured program of "The Next Big Idea", presented and discussed the processes used by the artists and scientists during their collaborations.

- Monday and Tuesday, Sept. 17 and 18: Santa Fe Institute, SARC Working Group, with 20 invited (national) participants, discussed the future of SARC and Art/Science in general, with a focus on pragmatic next-phase strategies. A major focus and action-agenda item was curriculum for art/sci (STEAM) education, as well as funding options. We were fortunate to be able to coordinate agendas with NEA and SEAD representatives. In addition to SARC directors and artists, participants included: Laura Monroe, LANL; David Rogers, Sandia Labs; Bill O'Brian, NEA; Deana Pennington, UT El Paso; Carol LaFayette, TAMU and Roger Malina, UT Dallas; Andrea Polli, UNM; Thomas Caudell, UNM; Jim Crutchfield, UC Davis; David Dunn; and Jennifer Dunne, SFI.

- Thursday, September 20, 9:00-10:20 a.m.: ISEA2012: "SARC: Art & Science": artists and science researchers' presentations at the Natural History Museum in Albuquerque.

- An exhibition of ISEA2012 Residency works (w/ SARC) opened at UNM School of Architecture, on Sept. 19th. SARC information is on the ISEA2012 web site and in the ISEA2012 catalogue and all publications.

- Tuesday, September 25, 1:30-3:30 p.m.: ISEA2012: "Art & Science: The SARC Process" presentation at Santa Fe University of Art and Design, with participation of 25+ students from New Mexico School for the Arts, and a class from Santa Fe Community College, plus many US and international ISEA2012 participants attending Santa Fe Day events.

"A portion of my research is focused on developing and testing immersive virtual reality interfaces to complex datasets and simulations. The use of virtual reality (VR) technology provides an opportunity, for the first time in the history of computation, to immerse scientists, with all of their naturally evolved human perception and reasoning, directly into multi-dimensional multiodal representations of their software and data. I believe that many new representations will blossom through the collaboration between art and science, allowing us to reach many new levels of comprehension."

Thomas Preston Caudell, Ph.D., Prof., Dept. of Electrical & Computer Engineering, Dept. of Computer Science and Dept. of Psychology, UNM (coined the term" 'Augmented Reality')

- Leonardo, an M.I.T. Press publication, will feature an editorial on SARC, and the NSF funded SEAD (Science, Engineering, Art, Design) initiative will publish a 'white paper' on the SARC program, including intended next phase efforts.

- The New Mexico Consortium prepared a SARC press release, and an article for Essence, Los Alamos' monthly events paper, in coordination with the 2012 Next Big Idea Festival.

- Development of SARC higher education programs is currently in early stage discussions with UNM, SFUAD, IAIA, UT Dallas, UC Davis, other university contacts and funders.

- A newly forming Advisory Group, currently includes Andrea Polli, Associate Professor of Art and Ecology, at UNM; and Roger Malina, Professor, UT Dallas, and Executive Editor of Leonardo Publications at M.I.T Press.

- There are currently two SARC web blog sites, one http://nmsarc.wordpress.com for public information, and one for use by collaborating artists and scientists. SARC's developing online presence will also serve to coordinate and communicate among the newly established SARC Pool, an ever-extended pool of creative collaborators.

North Central New Mexico: Place-Based Assets, Needs and Opportunities

North Central New Mexico is home to a number of the nation's leading science and technology research institutions and to a globally acclaimed arts community, within a rich multi-cultural and bioregional "land of enchantment" setting. The region encompasses Taos, Espanola, Santa Fe, Los Alamos, Rio Rancho and Albuquerque, plus many more rural and pueblo communities.

Santa Fe has a vital and diverse arts and cultural economy, designated as an official UNESCO Creative City. Santa Fe Institute and the Center for Non-Linear Studies at Los Alamos Laboratory, have made this the dynamic center of the 'complexity sciences' community. Santa Fe is home to the National Center for Genomic Resources, as well as the Institute of American Indian Arts, Santa Fe University of Art and Design and St. Johns University.

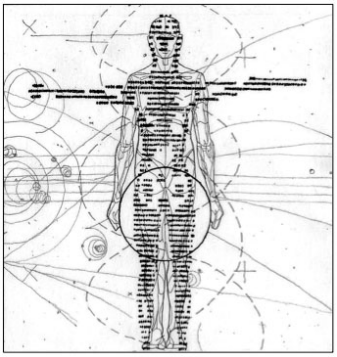
Los Alamos is currently taking big steps forward on "Next Big Ideas", to leverage its science and technology research economy with a new cultural plan and initiatives to economically vitalize that community, including a potential community-wide fiber-to-the-premises initiative.

Sandia National Laboratories is in Albuquerque, and Intel has major facilities in nearby Rio Rancho. University of New Mexico, with main campus in Albuquerque, is the state's leading research university, with satellite campuses In Los Alamos and Taos.

Beyond this north central region, the State of New Mexico has other rich arts, sciences and technology resources, including the other two state research universities (NMSU in Las Cruces and NM Tech. in Socorro), the Navajo Nation, the Large Array, and the NM Spaceport.

North Central New Mexico also lives with a responsibility to transform a number of 'wicked' undermining eco-social problems. K-12 education attainment in New Mexico is near the bottom of all state rankings; with the same true for broadband adoption. As is the case everywhere, this region must better address long-term economy, healthcare, energy and water resource issues. And, while our National Labs are major science centers, their nuclear weapons work presents and represents among the greatest controversies and risks for the survival of life on this planet.

SARC is intended as a means to grow a more vibrant future for this region with its unique resources, needs and opportunities. SARC intends to work in coordination with other regional public and private sector planning, incubating and realizing efforts, so as to foster most broadly benefiting impacts, investment strategies, creative visions and social outcomes.



SARC Next Phase: 2012-2014

While there are complexities and difficulties yet to be understood and addressed, a number of encouraging opportunities have emerged in this first round of efforts to institute an arts/sciences initiative in New Mexico. We therefore intend to now build upon this Summer's collaborative start-up, on lessons learned and on determined best-practices, to become an ongoing initiative emerging to have convergent benefits:

- For the sciences
- For the arts
- For education
- For society

For its ongoing life, SARC is now a program of the Santa Fe based Art and Science Laboratory (ArtSciLab), a 501(c)(3) nonprofit organization. ArtSciLab, founded in 2000 by composer David Dunn and 'complexity' physicist Jim Crutchfield, with Woody and Steina Vasulka and others, having set example for among the best in art/sci collaborations over many years, is an ideal fiscal organization home for SARC, and other possible cross-sector programs. http://artscilab.com

"Artists have a different skill set and training than scientists, and in particular, use their abilities to present complex ideas in a way that can be understood. We all live in a visually sophisticated society, and are familiar with visual language and metaphor, but these have not fully made their way into the scientific enterprise. Our culture is aesthetically sophisticated. Scientists share in this common culture, and we think that this collaboration of artists with LANL scientists should lead to innovative presentation of scientific research of national significance, and may lead the scientists to regard their work in ways not before considered."

Laura Monroe, Ph.D., Mathematician, LANL Production Visualization Project Leader in DoE's Advanced Simulation and Computer program, and Team Leader of the Special Projects Team in LANL's High Performance Computing division.

As we now proceed to build upon this Summer's initiating efforts, to shape an organizational, programs and budgetary agenda for the next two years, a number of intentions are emerging.

ArtSciLab/SARC aspires:

- To go beyond 'techne' to address more fundamental, all-encompassing ideas and issues.
- To focus on critical issues facing society, the sciences and the arts, in creation of projects.
- To partner to create 'great works' in the context of great challenges and opportunities.
- To demonstrate by example, collaborative processes, economic structuring and benefits.
- To provoke serious research, experimentation, play, trial and error, and elegant solutions.
- To take shared team approaches to research, learning, production and communication.
- To work with the SEAD community to add strength to our mutual advocacy and actions.
- To incorporate the cultural richness and indigenous knowledge in this geographic region.
- To advocate and set example for convergent arts/sciences for community eco-vitalization.

These underpinnings and intentions are helping us to shape a set of primary and peripheral programs, limited or made real by budgets, that separately and in total demonstrate a complex, dynamic and emergent 'ecosystems' approach to our convergent, hybrid practice: "ECOS".

ArtSciLab/SARC next-phase programs through 2014 are proposed:

- To strengthen existing arts, sciences, education and community institutional relationships.
- To develop an innovative economic support strategy for ArtSciLab's SARC initiatives.
- To host a series of (monthly) public seminars and workshops with artists and scientists.
- To establish and produce a 'new works' in the arts and sciences commissioning program.
- To organize an annual New Mexico (Los Alamos/Santa Fe) "Arts & Sciences Festival".
- To participate in networked arts/sciences interactions nationally and globally.

ArtSciLab/SARC is proposing an ambitious agenda for this New Mexico based co-laboratory. We look forward to extending our efforts to include other SEAD practitioners and programs, and to thereby add to our knowledge-based 'common pool assets'.

Obstacles, Opportunities and Suggested Actions

There are numerous obstacles, but also many yet untapped opportunities inherent to SEAD efforts. Some are general to almost all involvements, while some are specific to the many variations of SEAD collaborations, whether led by universities, corporations, government agencies, foundations, research institutions or individuals. For instance, adequate and appropriate funding or financing is a general problem, while issues such as security restrictions are specific to SARC and its collaborations with the National Laboratories (LANL/Sandia).

Addressing the issues, obstacles, difficulties, opportunities and suggested actions requires detailed assessment, specific to each potential players and sector (SEAD / SARC / artists and designers / scientists and engineers / research institutions / companies / educational institutions / funders and underwriters / communities and society / and other partners and participants). ArtSciLab/SARC's efforts are informed by years of lessons learned, best-practice experiences, humane insights and creative responses to the obstacles and opportunities of the moment.

Ultimately, it is experience and intent to achieve highest quality, intelligent, creative and mutually benefiting outcomes of the process and the work that will make a necessary difference.

SARC intentions, experience and fundamental understandings include requirements for:

- Personal rapport and mutual respect among potential collaborators.
- Creative open-mindedness, with complementary skills and understandings.
- Valuation of processes and outcomes with benefits for SEAD partners and for society.
- Ability to undertake necessary long-term, collaborative, cross-disciplinary R&D.
- Innovative funding and investment strategies with: .gov, .mil, .com, .edu, .org and .art.
- Artful example-setting in all aspects of SEAD programs.

Following is a one page "Call to Arts", advocating for greater eco-social responsibility in the arts, necessary for any meaningful work to result from SEAD initiatives. Similar one page 'calls' will be prepared for the sciences, for education and for society.

A Call to Arts

In this age, increasingly shaped by communications and technology, humanity is becoming acutely sensitive to its frail security. The rationalism of science continues to accelerate the conflict between global mind and local body. Energy and information are now our major exchangeable natural resources. They constitute the primary foundation of the value system in a newly emerging economic structure.

Within the broad framework of information theory, the arts are recognized for their communicative effectiveness and transcendence. The processes of creativity, though elusive, have lead mankind through historical mazes of uncertainty. In an information-based society, cultural development may assume an economic value comparable to commercial development in industrialized society. Having learned to recognize the complex ecological interdependence of living systems and the environment, artists now have opportunities to produce models for a sustaining cultural ecology.

The arts, reflecting the state of today's larger political, economic and social systems, are in serious trouble. Too many artists are playing it safe. The role of the arts in our society is increasingly shaped by confused intellectualism; selfish vested-interest capitalism; and absent-minded, fashionably crafted artificiality. At the same time, the rich diversity of wilderness and indigenous cultures around the world, are increasingly being valued for their scarcity and novelty, while being exterminated and replaced by the greed of progress and 'new world orders'.

There is a critical need and an all important opportunity for creative people, artists, to take advantage of the great independence and freedom inherent in their calling, to take a more active personal responsibility to be proponents of a true sense of ecology; a cultural ecology.

To call oneself 'artist', is either a grand conceit, or a bold decision to assume greater individual creative freedom. That freedom ought to carry with it, a responsibility for honesty and transformative intelligence. Artists, having chosen a freedom of aesthetic and intellectual vision and pursuit, are often at odds or in conflict with prevailing social norms. This is precisely the artist's value. The artist is in a way, the personification of society's means of checks and balances; a sensate explorer seeking to be 'in tune'.

If we take the incentive of applying our creative talents towards an ecologically considered future, we must be comprehensive. Society is in need of clear, intelligent, inspired under-standings and visions, the nonmaterial assets that constitute the true wealth and aspirations of a culturally secure community. As technological development shapes our concepts of the future, artists working with new tools and processes need to weigh the eco-cultural worth of their endeavors, to not merely be narrow-minded advocates of technological consumerism. As communications systems advance into the 'photonic era', where will we find enlightenment?

Will artists, synaesthetic pathfinders, contemporary tricksters, lead the charge for a real Information Revolution? Artists, as cultural agents, must make some difficult decisions, but have equally exciting opportunities to set examples, create models, and express simple truths. Amid life's complex compromises, creative idealism must be part of the equation. *R. Lowenberg*