

BRIDGES REPORT 5000 Words

Final Version (12/13/01)

1.1 BRIDGES Consortium: Description and Objectives

The BRIDGES Consortium was formed in 2001 to create a network for the development and dissemination of strategies to improve and support the practice of interdisciplinary collaboration in the arts, sciences, culture, and technology.

The increasing complexity of technology requires both deeper levels of specialization and greater levels of collaboration between disciplines. Differences in work and communication styles, priorities, educational principles, institutional frameworks, funding models, temperaments, and even fundamental values have the potential to become either obstacles or stimulants to effective collaboration. The greatest challenge for those involved in the communication revolution is not technology, but communication between people. The BRIDGES Consortium, initiated jointly by the Annenberg Center for Communication of the University of Southern California in Los Angeles (USC), California, and The Banff Centre New Media Institute (BNMI), in Banff, Alberta, Canada, will create an international forum and think tank to study and enhance the process of interdisciplinary collaboration in the arts, science and technology.

The BRIDGES Consortium “think tank” brings together top experts from educational, research and funding institutions, the private sector, and independent artists, technologists, and scientists, experts with a known track record in this area, to explore art and technology collaboration and its own unique set of issues, challenges, opportunities and skills. BRIDGES pinpoints collaboration itself as a skill to be identified, studied, and learned, and proposes practical strategies for including it as a vital component in education, creation and research.

The BRIDGES Consortium is structured around an annual summit. The first of these was held May 31-June 1, 2001 at The USC Annenberg Center for Communication. The second will be held the first weekend of October 2002 at The Banff Centre and will expand to include social science and humanities research.

The BRIDGES web site provides the general public access to the results of this work, including online proceedings for each event and a publication. It will encourage ongoing dialogue, networking, and support, and the opportunity to form new collaborative partnerships. Our goal is to aggregate international efforts and make them accessible to anyone interested in this area.

BRIDGES was co-founded by Celia Pearce, formerly a Visiting Scholar at The USC Annenberg Center for Communication, and currently an independent writer/artist and Lecturer in The Claire Trevor School of Fine Arts at the University of California, Irvine,

and Sara Diamond, Artistic Director Media & Visual Arts, Executive Producer Television & New Media, The Banff Centre New Media Institute. Phase 1 of the project was made possible through financial and administrative support from the Annenberg Center and administrative support from The Banff Centre.

2.0 Summit Results

The following report is a summary of the results of the first BRIDGES Summit. A full-length report as well as full online proceedings will be available at the BRIDGES web site at www.annenberg.edu/BRIDGES.

2.1 Introductory Remarks

The BRIDGES Consortium was formed out of a need we saw in our day-to-day activities in the field of cross-, inter- and trans-disciplinary collaboration. There are special challenges we face largely due to the fact that we are, in a very essential way, breaking down traditional boundaries, which are not only practical, but also culturally encoded. In Western culture, art and science have now come to be largely divided. The historical context of the computer and the shift to a science and technology-driven culture has magnified this dichotomy. Now, both technical and creative expertise, as well as humanism, has come to be recognized as essential to the successful integration of technology into culture. New forms of trans-disciplinary discourse have emerged. Since the 1960's, artists and technologists have joined forces to create new forms of understanding and expression. Today, there is a worldwide community of innovators engaged in the convergence of art, technology and science, and a number of vital and active organizations engaged in this work. Yet there seems to be very little discourse about the *process* of doing interdisciplinary work. We feel that interdisciplinary collaboration is a discipline in and of itself. The BRIDGES Consortium will create a collaborative forum for the study and development of interdisciplinary collaboration as a practice.

The Banff Centre joined forces with USC in the creation of the BRIDGES initiative to bring together overlapping and separate networks in the areas of arts, culture, science and engineering collaboration. The hope was to achieve a deeper analysis than has happened in the past of the key frameworks, questions, projects and methods that have structured and defined the practice of culture and technology research and creation. We wanted to approach this area critically and from a variety of perspectives and methods, playful, analytic, collaborative. We wanted to step back from assumptions that all arts and science collaboration is beneficial, or good, and instead assume that we need to state why we work, how we work and where we want to move to next. We also wanted to start really evaluating outcomes in this field to better understand and optimize our collective impact.

We hoped to come away from this year's event with a set of methodologies that could facilitate the inclusion of social science and humanities researchers and projects that combined a wider set of disciplines when we reconvened at Banff in 2002. We wanted to test the waters for ongoing communication and projects, without intensifying workload. We wanted to kick-start a more focused and ideologically clear set of collaborations and

discussions in this field. We included Canadians, Americans, Europeans, and Latin Americans as well as participants from the Pacific Rim.

2.2 Creating Context: Historical Overviews

The first day focused on creating a cultural and historical context for art and technology collaboration. A round table of brief introductions by participants launched the conference and immediately highlighted a prominent issue: most people could not describe themselves in a sentence since each individual participant was, to a varying extent, interdisciplinary. BRIDGES members then laid a foundation for discussion by providing historical overviews. Early projects of the 1970's included University of Illinois Chicago's Electronic Visualization Laboratory (EVL) create models. EVL emerged at a moment when visualization technologies were on the upswing and provided a basis for common goals. EVL Director Dan Sandin pointed out that artists offered their knowledge, communication design and project management skills. Scientists provided the content and design challenge, and the means to raise money to give artists access to high-end technologies. The CAVE, a now-standard immersion display environment for Virtual Reality, is an invention born of this art and technology collaboration, the direct result of a trans-disciplinary approach to problem solving. As a result of these collaborations, the "interdiscipline" of scientific visualization was born.

Randall Packer and Ken Jordan were able to synthesize a number of the key ideological and practical threads from their upcoming book, *From Wagner to Virtual Reality*; in particular a historical mirroring in concepts that evolved more or less simultaneously in art, science and engineering at the end of the Second World War.

Independent artists Kit Galloway and Sherrie Rabinowitz, co-founders of Electronic Cafe International, discussed their strategic collaborations with NASA. They described their practice, dating back to multi-site dance performances using NASA satellites in 1977, as one of "experimentation," and the creation of context for collaboration. Their pre-Internet experimentation with issues such as mediated presence and the aesthetics of latency provide valuable insight into the sociology of current communications patterns.

A number of BRIDGES participants expressed a strong interest in challenging the utopian vision of science and what was referred to as "the first person approach in science." Mara Beller talks about this in a book called *Quantum Dialogue*, in which she charts the internal battle of the quantum physicist. A key premise of the book highlights the role of *dialogue* as the process used by scientists to reach their conclusions. Dialogue is key to understanding how stories in the histories of science are constructed.¹

Randall Packer, Director of Zakros InterArts, recalled a radical suggestion by Billy Kluver, pioneering co-founder of EAT (Experiments in Art & Technology): "the idea of putting the engineer at the service of the artist in order to subject him to the artists concern for the integration of technology and the context of cultural issues."²

Computer scientist Dan Sandin disagreed: “I’m just a little bit surprised that artists put themselves in the roles of critics of science activity. Because I don’t really think the artists have traditionally been critical of their participation in society (any) better than scientists.”

Related to this discussion is the “contained” motivation scientists have in collaborating with artists in serious research. Scientists may think that the contribution of artists is not valuable. It may mean that methodologies and practices are bipolar. It may be a communication issue. One tension that arose was U.S. Military interest in artist-led research and development. The USC Institute for Creative Technologies, represented by Jacqueline Morie, applies the entertainment industries production value and story craft provoking emotional experiences in military-based training and simulation. Artists question the merit of these kinds of exercises and their potential for unintended consequences. The subversion of military funding art projects under the auspices of research is nothing new. Not to mention the many military-funded research initiatives that result in great benefits to civilians, the Internet being perhaps the most obvious example.

The conclusion on the role of art/science collaboration as a practice seemed to return to the complementary roles of artists and scientists, with artists providing lateral thought about technology and science, socializing and humanizing technologies, challenging dominant structures in this process and engaging in actual invention. Warnings were also sounded about artists naturalizing technologies, undertaking naïve, dangerous or opportunist collaborations, and sidestepping social and humanist analysis. At the same time, there was a sense the artists were capable of deep intervention into actual invention as well as the critique of technology or science, within a range of value structures. Sherrie Rabinowitz reminded us that scientists have aesthetics too. “They’ll tell you that this is a really beautiful equation, and you’ll understand their enthusiasm about the beauty of the way these numbers work together.”

2.3 Inter-Communications: Language Experiments

In looking at issues of interdisciplinary collaboration, it was apparent that language was a fundamental issue. It has been well argued that language has material effects. Language embodies our view of the world, how we understand others and ourselves, and social, natural and cultural forces. Fundamental to language is a struggle for precision, the need to express nuance, the capacity to communicate. Yet language is also a tool for metaphor, for abstraction, for movement. Language is a means of excluding and including. It is used to mark boundaries, to separate categories. Language designates change, integration, and flow. Interdisciplinary communication can reduce the complexity within a discipline in ways that undermine deep research, or it can underline the ability to create new, hybrid understandings.

Sara Diamond and several others led a language workshop to explore the way language both connects and separates. (A full-length transcript can be found on the BRIDGES web site.)

The first phase, a question-and-answer exercise, had half the participants write a question using the terms “surface tension” and the other half write an answer using the words “Because the artist...” These were then mixed up and read in randomly generated pairs. This Surrealist language game was valuable for a number of reasons. The game arranged thought in lateral compositions, highlighting the ambiguities of language. It also precipitated various biases and cultural coding that exist within language.

The second phase was an exercise in definitions. All of us had spent hours in meetings, discussions, creative and technical design processes where radically different assumptions were made about what a word meant. Volunteers were asked to define the word “primitive.” The comparisons showed conceptual links between social science, anthropology and computer graphics as well as cultural biases around primitive or pre-literate cultures. In discussion, the group voted to sustain the tension between the definitions, considering that language is generally defined by context.

In the third phase, we broke into groups to negotiate and explore definitions of words we saw as conceptual watersheds. The final words selected were: *performance*, *interdisciplinary*, *artifact*, *collaboration*, *model*, and *representation*. Each group explored a collective set of meanings and implications for their selected word. We then shared our results. Conversations moved between finding a precise more narrow term, or an inclusive definition. An example:

- **Artifact:** Compared computer graphics (artifacting) with cultural definitions, to find a value scale. The term can be seen as negative or positive—with a relationship in both forms to ideas about authenticity. Can one can make an artifact deliberately, or just identify its presence? Artifact is a record of time passing, it carries information, and its value is based on who is looking at it. An artifact is a trace element; unintentional artifacts can become desirable in a range of contexts; artifacts have to be unpacked, traced back; they serve as forensic evidence of past events. Two new words, *artifactual* (the relationships of artifacts to time) and *artifactory* (to forge antiquities) emerged from the discussion.

The insights uncovered through this playful and immersive process were surprising and delightful, bringing to everyone’s attention the vital need for ongoing linguistic analysis.

2.4 Summary of Discussions

In reviewing the provocative discussions that occurred throughout the two day BRIDGES Conference many major themes arose that deserve further attention:

Interdisciplinarity and the Lack of Scientists

- **Not enough scientists present.** The number one issue was an underrepresentation of scientists and technologists. Those who did attend were enormously helpful in identifying some of the reasons behind this. One was a concern that scientists had not been included in the initial planning for the event. Another is that the reward structures for science and technology do not support participation in this type of activity. Next time, each artist will bring a scientist; perhaps each scientist should bring an artist.
- **Disciplinarity itself an issue.** People felt that the notion of discipline-as-identity and as boundary condition only reinforced some of the problems, including the reinforcement of counterproductive stereotypes. BRIDGES participants, by definition, are people who question and break boundaries, as well as embodying the breaking of those boundaries. Perhaps being interdisciplinary is itself a meta-discipline, which seeks to form connections rather than boundaries between things. It is through this crossing of boundaries that we have given birth to new “interdisciplines,” such as scientific visualization.
- **Break down boundaries/Identify skills.** We need to find a way to break down boundaries and avoid language and frameworks that support differentiation.
- **Model ourselves.** One suggestion was to create a visualization tool that would allow us to map skills constellations rather than defining individuals by their skills. In this way, we could diagram our practice as its own visualization problem.

Art & Technology Practice is Both “Hot” and Marginalized.

- **Finding the tipping point.** While many agreed that “collaboration” and “interdisciplinarity” were both emerging as trendy clichés and catch phrases, especially at the institutional level, it seems clear that the type of work we are engaged in has been marginalized in a variety of ways. Institutional, economic, educational, and social structures in both areas shun aspects of the other. Reward systems are structured to support narrow expertise. Furthermore, the current state of “the arts,” particularly in the U.S. but elsewhere as well, continues to be built on the framework of art-as-commodity. The value of such art is often correlated to the individual artist. This can create challenges for collaborative teams that struggle to give credit to all the team members in a traditional art exhibition. This is especially true when not all the collaborators are artists. Scientists don’t get tenure points for being in art exhibits any more than artists gain value by working on scientific research. In the U.S., art and technology works are more often seen in children’s science centers than art museums. There are also international exhibition centers and specialized venues, art festivals, computer science or technology conferences, and grass roots artists’ collectives. BRIDGES could seek new audiences and new contexts for this type of work, as well as helping it to find a way into traditional contexts.
- **On the verge.** There is no question the field is on the verge of reaching critical mass. Two large museum shows in New York and San Francisco are embracing art and technology. But many agreed that these shows sidestepped the existing art and technology community in favor of a more object-centric, museum-curator- and collector-friendly approach. Another sign is the explosion of interdisciplinary

initiatives in academia, and the emergence of important work entering popular culture. Mashiko Kusahara of Kobe University said, “What artists do almost immediately influences the culture through designers... and eventually influence the whole world of art and technology and science.”

The Role of Research—aRt&D.

- **aRt&D.** Anne Nigten, of V2 Lab and Encart, coined the term aRt&D to highlight the contrast from traditional R&D. aRt&D uses different processes, methodologies and objectives than pure science or technological research. Also, many art-based projects have a performative or production strand that demands quite a different way to work together.
- **Art as speculative research.** aRt&D is intrinsically more human-centered. Diana Domingues of University of Caxias Do Sul, Brazil, noted: “I think that what we are experiencing now is an anthropological evolution and not a technological evolution because we have new forms of life, new behaviors that we didn’t have before. That’s the part that for me is most exciting.” As Dan Sandin said, “Artist-organized projects helped visualize data and create media mechanisms; not just the content, but the mechanism for delivering the data.... Interactive art I view as kind of speculative research in the human computer interface.”
- **Value of art/technology based research.** Art research veteran Michael Naimark, formerly of Interval Research, laid out a value proposition for aRt&D projects:
 1. They provide stimulation and provocation to the research community, adding meaning, entertainment, and emotional resonance to their work.
 2. These projects often act as magnets to bring together unconventional combinations of skills and talents.
 3. They can also provide content to test tools and sometimes even tools to test content.
 4. They are means for collecting data, both through explicit query as well as through observation.
 5. They may lead researchers down unforeseen paths and result in new discoveries and intellectual property
 6. External deadlines and public scrutiny serve as a forcing function for decision-making rigor and completion. They kept us street -smart. Putting on a show allows us to test new ideas in a simulation of the real world.

Creating a Critical Mass

- **We need a community.** The general sense was that we needed a way to codify our community, to aggregate our organizations, our knowledge, our skills and our resources, to create a critical mass of people and ideas, and all agreed that BRIDGES was uniquely positioned to do this. We could have more influence and power, and have more impact on how our work is funded, created and disseminated.
The importance of strong communicators. We need strong communicators who can articulate the value proposition of foundational work in this field to diverse constituencies, including governments, corporations, museums, foundations and

others. Bronac Ferran of the Arts Council of England noted that:“ Unless the arts gets involved with these other sectors and tries to make a difference, then it’s really underplaying the potential of what artists are actually doing themselves. Let’s develop initiatives... it will allow us to actually influence policy in our own countries.”

Network, Knowledge and Resource Aggregation.

- **Aggregate and distribute existing research, resources and knowledge.** BRIDGES could serve as a means to aggregate existing knowledge, research and resources and create means for better communication and knowledge sharing. This would include doing joint projects with members engaged in similar efforts. It would also include creating portals on the web site to events, resources, information, etc. There was much agreement on a network-based aggregation of resources for:
 - 1) Connecting dialogues that are already going on
 - 2) Exploring existing tools and resources that support networked collaboration
 - 3) Joint presentations to potential funders
- **Resource bartering.** A proposal was made to create a system for resource bartering, which lets people use systems during downtime, such as summer or evenings. Students and equipment could be shared, as well as software, space, tools and other resources.
- **Validation/credibility.** BRIDGES could also play an important role in validating arts/science research. A great first step in this regard is the creation of a map of the network represented by BRIDGES participants. This may also be done through joint funding proposals.

Provisional organizational structures: Sustainability through temporality.

- **Should BRIDGES become an organization?** We discussed pros and cons of making BRIDGES into its own formal organization. Can we look at BRIDGES in the context of a provisional organizational structure that serves as an aggregator of existing organizations rather than it’s own entity?
- **Economies of scale.** Sara Diamond put forth the following questions, which form important lines of future investigation:

“Is it more effective to have a number of organizations networked in a permanent way and to work together and is there an economy of scale there? When is the network too big and not efficient? Dedicated focus networks sometimes make the most sense, right? What should stay local and what’s good networked?”
- **Sustainability and provisional networks.** An underlying aspiration is simply sustainability. The interests of an interdisciplinary field are by their very nature diverse. Ironically, this may be best achieved through creating a network of temporary or provisional constructs or “process hubs.” The latter are defined by business analyst Gary Bolles as “a central platform through which problems can be solved dynamically and the efforts of individuals and groups who can produce the parts of work necessary to accomplish the goals or vision of an organization will interact through that hub.”³ These hubs might be associations of people and

institutions, which fulfill individually defined goals, yet achieve some higher level objective. They might be projects, collaborations and frameworks undertaken with an implicit understanding that they will eventually conclude.

- **Concerns about volunteerism.** A concern was raised about the volunteer nature of the consortium and to make sure that people are able to follow through on whatever level of commitment they're willing to make.

Issues of Practice

- **Best practices research and workshops.** There seemed to be a real need to aggregate best practices by capturing past work through case studies and other means, and finding a way to document what has been done thus far. A suggestion was made to co-produce with members and member organizations a series of skill workshops in areas such as communication/language, collaboration, tools, groupware, and project management.
- **Language is fundamental.** The friction and fission of language across disciplines was an area that all agreed warranted further investigation. The experiential approach used in the language exercise led to a number of discussions on this topic. We talked at some length about poetics and the ambiguity of language, versus the importance of functional definitions that could move a process forward through precision. We discussed the value of definitions' capability to shift, as well as the value of understanding epistemology, or the evolution of language. Even natural language research with computers drifts towards ambiguity within a short period of time. We talked about competition around the creation of new words or definitions and how terms could draw boundaries that included or excluded and how technocratic cultures absorb terms that artists develop. All agreed that discipline-specific language should not be watered down for mass consumption, but conversely, cross-disciplinary collaborators needed to learn techniques for clarifying their meanings.
- **Education and student involvement.** Many felt that we needed to come up with strategies for integrating students into the process, both using them as a resource, and availing them of our collective knowledge.

Format for Next BRIDGES Summit

- **Organizers' authority (happily) usurped.** The organizers were very pleased that members handily usurped their authority and proposed an expanded and improved format for the second summit. One group in particular focused on this, but others supported and agreed with their approach.
- **Rethink BRIDGES Summit Format.** The next event should consist of small topical workshops derived from position papers submitted in advance, larger group sessions to share results of workshops, open time for individual networking, and some type of framework borrowed from the science world, such as poster sessions or technical sketches, which could be used to present works in progress for group critique. Results: each workshop group would produce a paper together documenting the results of their session(s.)
- **Regional events.** Also suggested was the possibility of having smaller, more regional events, perhaps even a chapter format of some kind.

Funding is Art Not A Science

- **The funding environment.** The funding environment is a complex, tiered, overlapping, conflicting and archaic process for anyone involved in the field. There are very few resources to draw from, so many start from scratch. Even when an appropriate source is found, the competition for funds is ridiculously intense. Conversely, some funds are underutilized and organizations complained of a lack of quality applicants. In the USA there are interesting mutant adaptations, such as hybrid art projects seeking science and military funding, and various forms of corporate sponsorship, including industrial R&D departments that function as art and technology incubators.
- **Corporate marketing strategies.** It was suggested that we could work with companies in creative marketing, advertising, commercial, sponsorship scenarios. For example, we could engage tool companies to sponsor webcasts, e.g., “webcast brought to you by...” by donating software, money, etc. If we are viewed as the expert “source,” this could be very advantageous for them.
- **Commercial research.** The conflict many artists grapple with in seeking financial support from commercial sources is typified by Naimark’s Interval Research experience where he says, “Our obligation was to protect what we did, but not necessarily market that.... in a very real way, it was to see if anything useful could come out of this in terms of intellectual property, while dealing with content that we felt was personally meaningful.” This approach represents at least some base ethical compromise that many of us can subscribe to in aRt&D.
- **Industry as a strategic partner.** We should look at industry as a strategic partner with eyes wide open. They could look at this as a tool for recruiting and as a way to test and promote their products.

3.0 Project Initiatives/Working Groups

The group developed a collective direction for the consortium, as well as seven concrete initiatives/working groups to make this vision tangible. In spite of our diversity, we share common concerns, passions and challenges. The following is a description of the Working Group initiatives that arose out of the final full-group discussion. A full description of the individual group results can be found on the BRIDGES web site:

Collaboration Best Practices Initiative

This group will focus on the practice of collaboration as a discipline using the following and yet to be developed methods:

- Collaboration, communication and project management workshops
- Document and Formalize Practices/Create a Best Practices Initiative:
 - Publish Case Studies, including projects of historical significance, to look at past processes that have lead to success, as well as failure
 - Create a framework for disseminating best practices in inter-disciplinary collaboration

- Prototype Project: Develop a group project whose process can be documented as a model for best practices
- Develop a Best Practices Network
 - Aggregate Current Research
 - Connect dialogues that are already going on
 - Explore tools and techniques that support proximal and remote collaboration
 - Present our results to potential funders

Event Planning Initiative

This group will focus on planning for future BRIDGES events including:

- Develop new framework for Next Summit:
 - Submission of topic proposals/position papers
 - Working Group format with large group reporting
 - Unstructured time to allow for informal interactions
 - Explore formats that incorporate both art and science frameworks, such as technical sketches or poster sessions
- Explore Distributed model:
 - Create regional “chapters”
 - Sponsor regional meetings, workshops and events

Festival/Prototype Initiative

- Create International Festival of Art/Tech projects, tied in with BRIDGES Summit; may happen via the web and/or multiple BRIDGES locations.
- Create Prototype project which can be presented as part of festival (may overlap with best practices group)

Visualization Methodology & Database Resource Initiative

- Explore Methods for visualizing and mapping interdisciplinary practice in a variety of context.
- Borrow from other areas outside our own.
- Come up with a variety of strategies for visualizing a database of ourselves.
- Explore new ways to think about organizing specializations that takes into account that individuals and institutions are also interdisciplinary.

Collaborative Networks/Resources Initiative

- Develop a database of resources.
- Create a collaborative network that we can all work within.
- Note that this group may have some overlap with the Network Aggregation group

Network Aggregation Initiative

- Build the BRIDGES community and aggregate the arts/technology network.

- This includes positioning BRIDGES as central to the arts & technology world, using it as a way to lend power and caché to projects, and as a rallying point for the formation of an international community.
- Find ways bring all our resources and communities together for knowledge sharing.

Evaluate Collaborative Tools (share testing and use)

- This group will serve an ongoing function of creating a system for evaluating tools for remote and other types of collaboration.
- They may evaluate tools themselves, interview users, or set up a system whereby members can report their own experience with various tools.
- Suggestion: create an automated system with a set of established criteria for user tool review.

4.0 Next Steps

BRIDGES Summit 2, to be held October 2002 at the Banff Centre in Alberta, Canada, will bring together the existing network, with the addition of international scientists, engineers, social scientists, and humanists engaged in collaborative research between culture and technology.

For further information and regular updates on BRIDGES and its activities, please visit our web site at www.annenberg.edu/bridges.

¹ Beller, Mara. *Quantum Dialogue: The Making of a Revolution*. 365 p., 12 halftones, 2 line drawings. 1999 Series: (SCF) Science and Its Conceptual Foundations series.

² Kluver, Billy. "The Great Northeastern Power Failure." Reprinted in *Multimedia: From Wagner to Virtual Reality*, 2001. WW Norton & Company, New York & London.

³ Bolles, Gary. "Death of the Corporation, Birth of the Process Hub." November 17, 2000. Creative Disturbance *EMERGEncy*, on the web at www.creativedisturbance.com

The Organizations

The USC Annenberg Center for Communication: *Working at the Interface of Content and Technology*

Created in 1993 through a grant from Ambassador Walter H. Annenberg to the University of Southern California, the USC Annenberg Center for Communication supports active research that addresses practical problems in the convergence of content and digital technology. Directed by a team of respected leaders from arts and entertainment as well as science and technology who embrace the cross-disciplinary ideas of its projects, the Center identifies and explores ways in which communication technology affects education, law, science, engineering, healthcare, arts, entertainment and politics. www.annenberg.edu

The Banff Centre New Media Institute

The Banff New Media Institute was founded in 1995 to stimulate dialogue and creative innovation in the exploding and ever shifting field of new and converging media. Talented individuals and companies from around the world come to BNMI to network, train, converge and collide. BMMI collaborates on and co-produces projects in a wide scope of new media areas, including: Creative content development and production methods, art and virtual environments, social and cultural analysis, implications of culture and technology, cultural difference, 3D web development, artist/engineer and computer science collaboration, user-driven technologies, policy analysis, and development and accessibility. www.banffcentre.ab.ca/nmi

The Authors

Celia Pearce

Celia Pearce is an interactive multimedia designer, artist, researcher, teacher and author of *The Interactive Book: A Guide to the Interactive Revolution* (Macmillan), as well as several other papers and articles on interactive media and game culture and design. She is currently a Lecturer at the Claire Trevor School of Arts at the University of California, Irvine. Previously, she was a Visiting Scholar at the University of Southern California, where she produced several conferences and helped to design an MFA Program in Interactive Media for the School of Cinema-Television. Ms. Pearce's creative projects include: Iwerks and Evans & Sutherland's award-winning *Virtual Adventures: The Loch Ness Expedition*, a 24-player virtual reality attraction; the *lounge@siggraph* and *The Virtual Gallery*, SIGGRAPH '95; and, *Body of Light*, which has been performed at L.A.'s Electronic Cafe and Canada's Banff Centre for the Arts. www.cpandfriends.com

Sara Diamond

Sara Diamond is an award winning television and new media producer/director, video artist, curator, critic, researcher, teacher and artistic director. Born in New York City, Diamond has resided in Western Canada and has represented Canada at home and internationally for many years. She is currently the Artistic Director, Media and Visual Arts and Executive Producer, Television and New Media at The Banff Centre. In recent years Diamond has worked increasingly with research and development projects in software, has consulted in developing interactive media curriculum and events and has created think tanks that bring together cultural industries, new media content producers, artists and investors. The Co-Production, CCII, and Deep Web projects that she has initiated at The Banff Centre have resulted in key international projects in television and interactive media. Diamond programs new media events for the prestigious Banff Television Festival and develops the extensive Banff New Media Institute at The Banff Centre.

Mark Beam

Mark is Co-Founder and CEO of Creative Disturbance, an international aRt&D network dedicated to advances in human-computer interface. It was founded to dramatically improve the artist and innovator's ability to execute his or her visionary project, and to directly connect investors, patrons and other resource providers to new opportunities. He is also a Co-Founder of Glass House Studio, an immersive visualization and simulation services company. Prior to that he directed beaming, llc., a new media venture consulting firm in San Francisco, advising public and private organizations, universities and corporations. beaming also produced "New Minds," a widely acclaimed lecture and performance series in San Francisco that focused on the cultural impact of new media. In a prior life Mark was an institutional securities executive, investment banker and trader. Mark is a member of the Board of Directors of Leonardo, an MIT Press published journal and network. He is an advisor to the Media Arts Department at SF MOMA and to WITI (Women in Technology International). www.beaming.com