Extreme Environments: Hong Kong's Art+Science Expeditions

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Abstract
Hong Kong’s Extreme Environments programme explores how student artists, researchers and scientists working together can collect and interpret environmental data using new forms of creativity and visualization. The programme promotes interdisciplinary research and discovery as an integral part of learning. The planet’s most remote landscapes are among the most fragile and endangered but also offer unique insights into a sustainable future. This project brings together teams from across the academic spectrum to help better understand issues that threaten nature and our cities. A groundbreaking experiment in transdisciplinary art+sci education, field research becomes a creative strategy and media art becomes a tool for scientific interpretation.

Introduction
To date, the expeditions have partnered with scientists in the Mojave Desert and Antarctica with an upcoming trip to the underground caves of Vietnam. Using computational sensing to collect a variety of datasets, interdisciplinary teams of students from such fields as art, business, engineering, natural science, and social science conduct research in remote locations. They then develop new media art projects that utilize new presentation technologies to offer innovative approaches to understanding climate change. The exhibitions present environmental data through new media artworks in diverse technologies like mobile game applications, light installations, interactive cinema, 3D immersive environments and kinetic sculpture.

The programme hybridizes endangered ecosystems differently than approaches in urban spaces. The remoteness of the site makes it nearly virtual—not physically accessible by most of society. The students use scientific study and documentation to give a distant user a multisensory experience of the sites. In Antarctica, 23 students took over 70,000 photographs, 100+ hours of video and over 85 scientific datasets and were followed by over 10 million people. While there, the students are avatars in a foreign landscape and their physical and emotional responses become performative. Upon their return, the natural forces measured the site are reconstructed by transforming the data into user experiences that include sonification, immersion, interactivity and performance.

Research-Based Arts Education
The programme follows a structured sequence of proficiencies. During the planning and on-site expedition, the students learn a scientific data collection skill. It’s key to note that the science is not meant to be groundbreaking but meaningful—a series of experiments that connect to a larger international body of science. The students learn the technology to do the readings and then the proficiency to do those readings in difficult conditions. The expeditions encourage the development of communication and networking skills as well as a set of personal strengths.

Upon returning, students must master a wide range of computational skills to find hidden patterns and meaning within the collected datasets. They also must visualize their projects through modeling and design software. This requires organizing, library and lab research, and

Fig 1. Students Measuring Air Quality with Lasers in Antarctica, 2014, photo, property of City University of Hong Kong.
investigation into emerging technologies for data manipulation and presentation. The artworks themselves require a range of budgeting, engineering, planning, and design skills to be developed. Students learn the business logistics of media production (e.g. film, print, web, application), manufacturing or fabrication.

Using emerging technologies to present the creative interpretation of their data encourages technical proficiencies that draw from both the physical and virtual learning done earlier in the process. However, the students also write and create their artists statements and document their process so that it can be presented to the public in an exhibition and website.

In steps, students learn and master scientific equipment, form partnerships and self-discovery, analyze with computers, budget and plan a large project, and present it to the public both professionally and using the latest technology. Without the journey as the metaphoric and structural model for learning these skills individually, they would be difficult for one course to teach.

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Art + Science

Project development is bottom-up: the students find classmates across disciplines to form teams. Every project is a hybrid of two or more fields of study that was envisioned and organized at the student level. Because of today’s social networks, friendships, hobbies and interests become the foundation in joining fields.

Each team then partners with scientific and academic researchers who share their approaches and tools. In Antarctica, students worked aboard a Russian polar research vessel with ornithologists, historians, botanists, geologists and other specialists who supported the study of such subjects as penguin colonies, glaciers, icebergs, wind patterns, plant life, animal behaviors and more. Delicate eco-balances are measured by learning the most current sophisticated sensor and locative technologies. A student learns how to produce meaningful data that is inextricably linked to the natural features of the sites. The environmental ‘footprint’ of this programme is designed to be zero, partnering only with scientific organizations that are dedicated to the protection of endangered resources to ensure that no project is invasive or damaging to the environment.

The presentation of that data requires in-depth artistic research in visualization strategies, often well outside the area of study for the engineering and science students in the programme. They learn how contemporary arts are embracing technology and using it in directions that often are prescient. Students learn computational and procedural programming as a generative art strategy, new 3D printing possibilities, advances in screen and projection technologies, new robotics, new interactions, new styles, new formats.

Merging research methodologies creates a context where a skill, scientific or artistic, is no longer specialized but integrated into a larger context. Unexpected hybrids form when the established goal of a field of study is diverted—an engineering skill is applied to art, an art skill applied to science. Specialization does not mean a singular path; the specializations from different fields can be applied to new contexts and yield innovative ideas.

Extreme Hybrid Spaces

The presence of the students and transmitted environmental data forms a unique hybridity at the sites. The 23 students were followed either through social or traditional media by millions of people and become avatars in the same way an astronaut is followed remotely. Nature is studied but users also observe the observers through an array of sensors, field research, interviews,
questionnaires, experiments and data mining techniques. The student teams wore ‘black boxes’ 24/7 that continuously measured location and altitude. In Hong Kong, friends and family saw locative information on their student but also comprehensive environmental information such as weather, ocean depth and water sample statistics, expedition data such as voyage charts, wildlife sightings and GPS information, and personal and cultural data such as diet, correspondence and physiology. One remote artwork extrapolated the GPS and altitude data to reveal the terrain—the students unknowingly ‘surveyed’ the sites visited. Another artwork pulled keywords from the student text and email messages home and developed an algorithm that tied emotion to place, mapping the feelings of the team so far from home.

Fig 3. Installation Showing Topography Captured Through Student Movement in Antarctica, 2014, photo, property of City University of Hong Kong.

Mediated Earthworks

Upon the return, however, the hybrid space flips. Instead of a virtual visitor to a physical space, the space is mediated and presented to physical visitors. Forces of nature, captured through numbers, become the drivers in a new media artwork. Computational sensing allows for more than just memory through image, it allows for place to be recorded and replayed in new sensory contexts.

For example, Antarctica wind movement was measured through a kite-surfing performance and contrasted with Hong Kong’s ‘wall effect’—the density of architecture that blocks cooling entry. Visitors could actually compare wind movement through an interactive system. UV-B radiation was shown through lichen growth and skin damage, microscopic organisms presented in an immersive environment to emphasize their importance, and air pollutants were measured in Antarctica and Hong Kong and compared through ‘veils’ in a massive light installation. One project compared the color spectrum of the South Pole’s pure light with Hong Kong’s artificial (the most light polluted site on the planet) and presented the colors in a 360-degree theatre. The invisible forces within nature were captured and then visualized in new forms.

Two projects investigated social components. One team investigated criminological, psychological and environmental topics related to isolation through interviews and site measurements of prisoners, field scientists, military personnel and ranchers and tied their findings to a live street performance in a 1.5 x 1 x 1 meter ‘cage flat.’ Visitors could gain insight into Hong Kong’s own extreme environment: the restricted, cage-like flats that house thousands of its population. Another team investigated Antarctica’s bartering practice. With no currencies, money circulation or government regulations, Antarctica has a unique economic system with personal social interaction built into it. The team collected data by creating a hands-on barter experience during the length of the expedition. Visitors to the exhibition could take a specially-made souvenir but only by trading it for something in their pockets. The team presented the direct exchange of goods and services as an effective, sustainable and environmentally responsible solution but also a type of social network to exchange culture, values, knowledge and business information.

Closing Remarks

Dean Jeffrey Shaw provided the closing remarks for the exhibition. “Art practice in the 21st century is no longer a purely self-focused enterprise. The exigencies of the contemporary social and environmental contexts create new urgencies that call upon the artist’s inventiveness and insights to contribute to a better understanding, and to possibly even provide solutions. Therefore it is the responsibility of arts schools today to cultivate in students in their training the desire and capability to address these contexts. This implies the ability to work in trans-disciplinary groups, and develop the communication skills that enable artists to engage and integrate the language of their practice with those in other fields. Only in this way can they be equipped to creatively address the full complexity of our current condition.” [1]

References

1. Jeffrey Shaw, “Closing Remarks,” Freeze Frame Exhibition Catalogue, ed. Scott Hessels (Hong Kong, City University of Hong Kong 2014), 113.