GIGAPIXEL IMAGING FOR PARTICIPATORY SCIENCE LEARNING

PROJECT OVERVIEW

The University of Pittsburgh's Center for Learning in Out-of-School Environments (UPCLOSE), the Carnegie Museum of Natural History, and the Robotics Institute at Carnegie Mellon University are collaborating to build an open access cyberlearning infrastructure to enable deep exploration, mediation and conversations around super high-resolution gigapixel imagey and data simulations. This emerging class of big image, big data visualization technology holds promise as a powerful tool for scientific research, science communition and learning.

The project team is designing, developing and producing a set of demonstration projects that seek innovative forms of participatory science learning across three approaches to public-science interactions: Public Understanding of Science (PUS), Public Participation in Scientific Research (PPSR), and Public Engagement with Science (PES). The content of the demonstration projects will draw in part from the scientific research, collections and education programming of the museum and be refined through formative evaluation. In addition to our specific public target audiences described in project overviews, we will study whether these experiences change the perceived attitudes and abilities of the scientists and museum professionals involved to imagine and desgin more participatory kinds of learning and public engagement activities.

FRAMEWORKS FOR PUBLIC-SCIENCE INTERACTIONS

Public UNDERSTANDING of Science [PUS]
teaching + learning ⟶ understanding (awareness, appreciation, knowledge . . .)

Public PARTICIPATION in Research [PPR]
contributing + collaborating + generating ⟶ participation in research

Public ENGAGEMENT in Science [PES] Technology Engineering Art Math . . .
dialoguing + mutual learning ⟶ engagement

Further reading
McCallie, E., et al. (2009) Many Experts, Many Audiences: Public Engagement with Science and Informal Science Education.
A CAISE Inquiry Group Report. Washington, D.C.: Center for Advancement of Informal Science Education (CAISE).

Bonney, R., et al. (2009) Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education.
A CAISE Inquiry Group Report. Washington, D.C.: Center for Advancement of Informal Science Education (CAISE).

GUIDING RESEARCH QUESTIONS

Q1: Could we, through a design research process, demonstrate innovative applications of networked gigapixel technology to support participatory science learning experiences?

Q2: To what extent, and in what ways, could this technology facilitate scientists and informal science education professionals in developing more participatory public-science learning interactions?

Q3: Does the technology support a participatory culture* and associated practices around science?
*Culture as a setting in which publics, scientists and ISE professionals, feel they meaningfully and collaboratively contribute to the understanding of and activities surrounding an issues and/or content of interest (Jenkins et al. 2009).
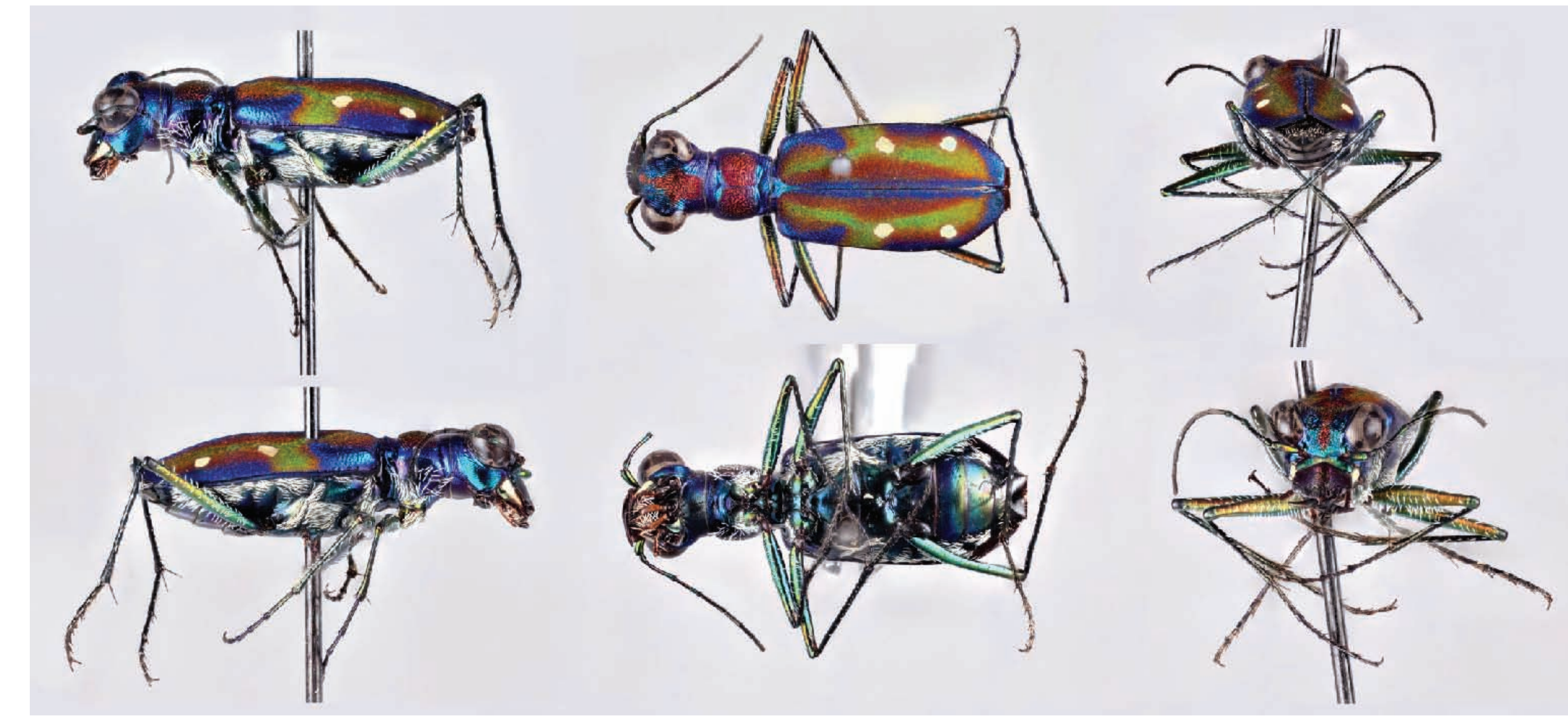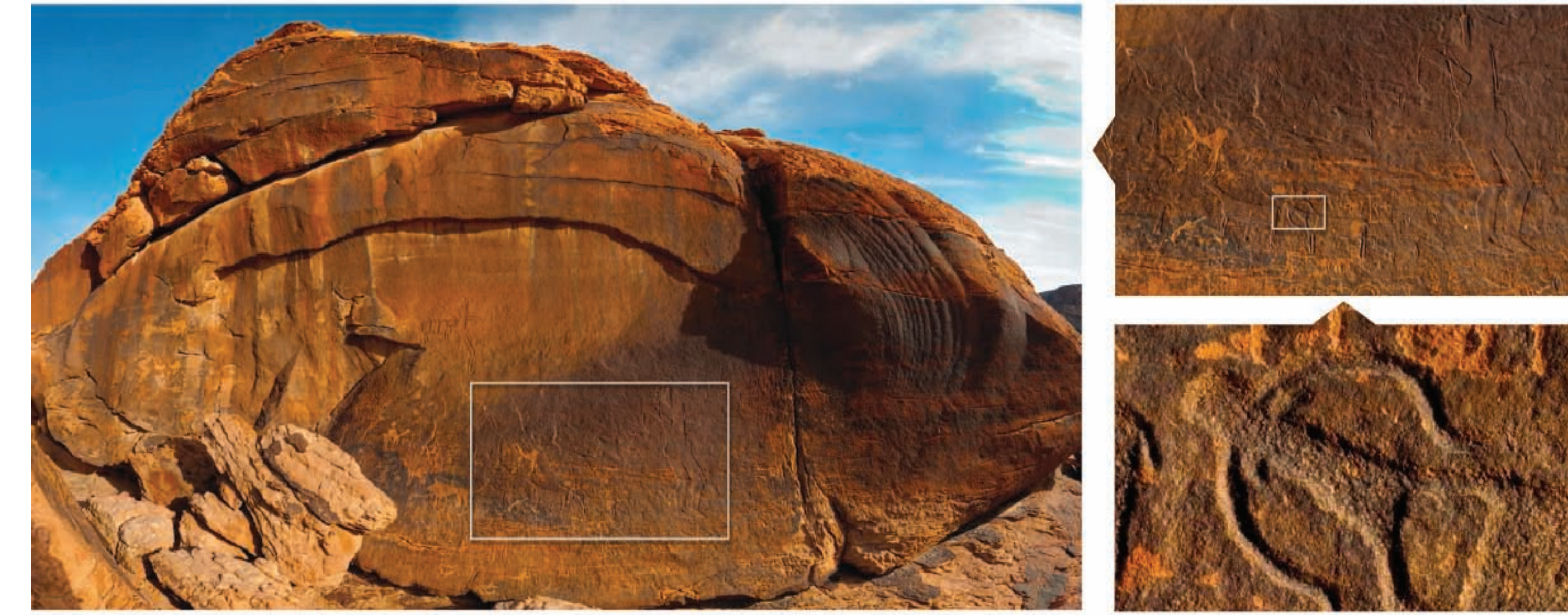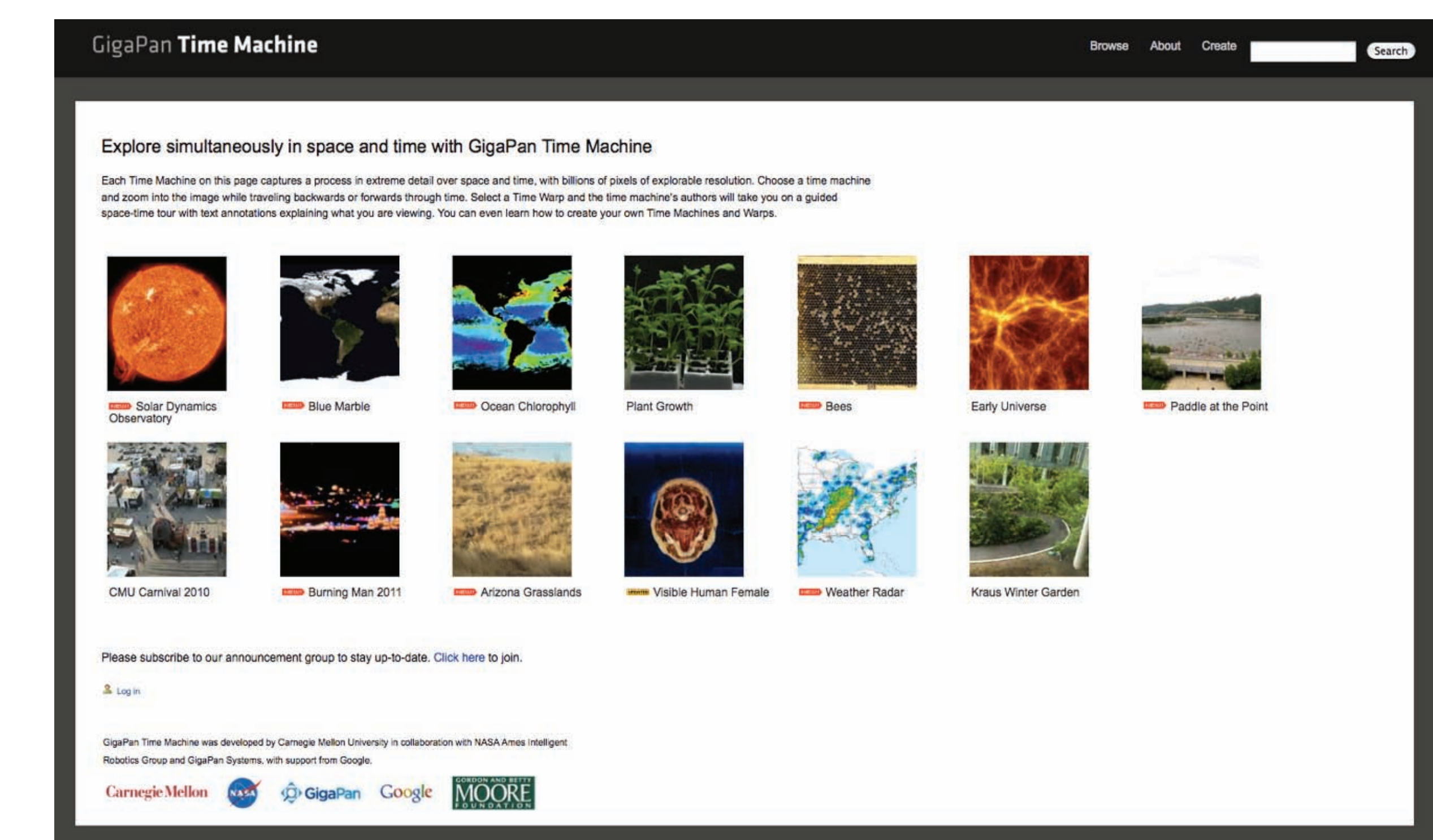
Use Case 1 — Public Understanding of Science (PPS) Demonstration
Science Topics — Archeology, Evolution, Paleoclimate change
Target Audiences — Museum visitors, online communities of interest
Impact Evaluation — Communicating research, content knowledge, participation

Our first prototype is being developed with Dr. Sandra Olsen, Curator of Anthropology and Archeology, and part of a team investigating a set of petroglyphs in the remote Saudi Arabian desert. The engravings date back to the Holocene Wet Phase (9000 B.C.E.–5000 B.C.E.) when the environment resembled that of today's African savannah, where lions, gazelles, cheetahs, wild antelope, and hyenas roamed the land. Inscribed in the rock in fine detail are camel drawings, horse-drawn chariots, and hunting scenes that show early human domestication of animals. Through a formative process we will develop rich mediation tools to support conversation and storytelling. Students at Carnegie Mellon University's Design School will be working with us and the scientists to envision ways we can integrate networked gigapixel images and social media into the learning experiences beyond the museum walls. The British Museum in London will open the *Stories in the Rock* exhibition May 2012 as our first use case.
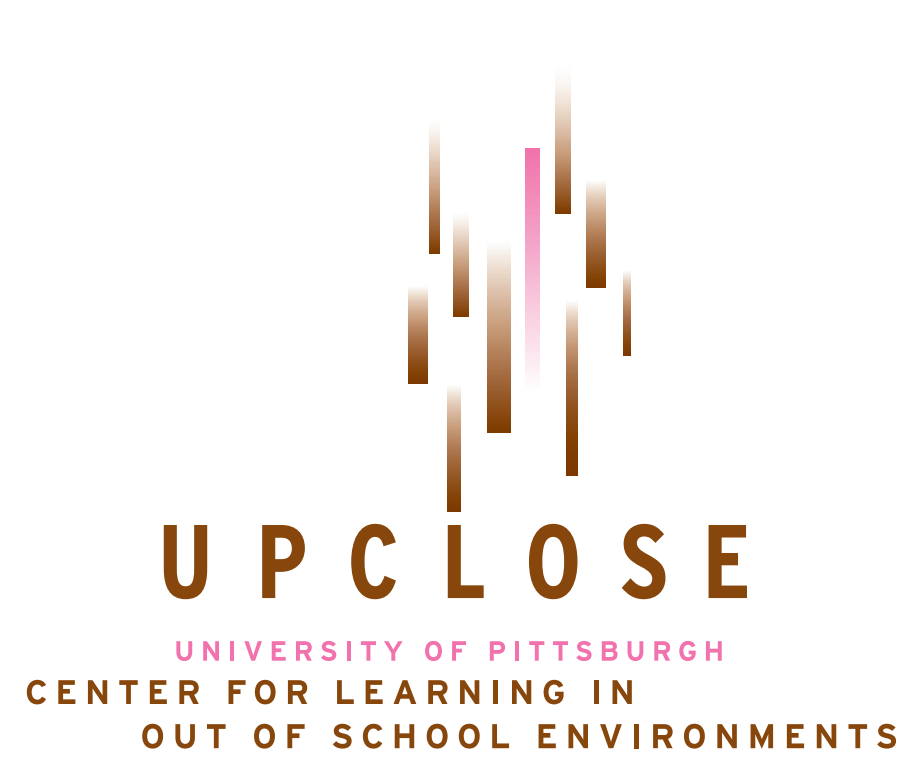

Use Case 2 — Public Participation in Research (PPR) Demonstration
Science Topics — Biodiversity, Phenology, Water quality monitoring, Macro-invertebrates
Target Audiences — Citizen Scientist, Science professionals, Fishermen /kayakers
Impact Evaluation — Science skills and processes. Content knowledge, Affect/efficacy

This demonstration project address a timely need by both the scientific and public communities with respect to monitoring regional water quality as land use and energy extraction patterns are rapidly changing in the our region. Insects collected in streams are increasingly used in water quality monitoring protocols as aquatic arthropods provide an integrated perspective on water quality. To support several public uses, we are working with Dr. John Wenzel will create an online identification reference and training tool with gigapixel images, embedded annotations and video, and original text regarding the habitat (insofar as it is known) of different species of aquatic invertebrates. We will test whether the platform can scaffold species identification and counting task so community groups can leverage biotic water quality data as part of PPSR projects. This use case will test the use of the

Use Case 3 — Public Engagement with Science (PES) Demonstration
Science Topics — Natural resource management, energy use, environmental decision-making
Target Audiences — Stakeholders, Experts, Policymakers, Publics with/out science backgrounds
Impact Evaluation — Community decision making, communicating research, collective efficacy

Natural gas drilling in the recently tapped Marcellus and Utica shale formation presents a major economic development opportunity for Western PA. At the same time, the hydraulic fracking activities, and the development of the processing and transmission infrastructure for this shale gas extraction boom pose significant environmental questions for the region—and community members are looking for places to engage in informed, meaningful learning, and discussion. The goal of this use case is to demonstrate how a networked, gigapixel-image based platform can facilitate experts, various stakeholders, and publics in mutual knowledge building through scientific discourse, exploration, and debate around a contemporary, science-based issue. CMNH will host a series of in-person and web-based forums that draw on high resolution images, geolated data, and timelapse to ground community discussions on visual evidence. These events are designed to value and make explicit the diverse aspects of the issue—science, social science, and values—and to provide means by which publics, scientists, business people, and policy makers can engage meaningfully.

TECHNOLOGY FOR EXPLORING BIG IMAGES, BIG DATA

http://timemachine.gigapan.org/wiki/Main_Page