

Bella Gaia and the Pedagogical Power of the Overview Effect: An Interview with Kenji Williams

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Abstract: *Bella Gaia (Beautiful Earth)* is a performance that combines a world-music inspired soundtrack with projected graphics, animations and video to educate about climate change. A hybrid of art and science, the nonlinear performance is an example of an emerging form of ecomedia in which remote sensing media are used to transform audiences to experience Earth as an organic, living organism. Bella Gaia's creative director and creator, Kenji Williams, discusses this new form of educational experience. The violinist, composer and filmmaker incorporates a neuro-science driven methodology to create "immersive live theater, mixed reality, and interactive data visualization."

When I was kid growing up in 1970s Los Angeles, one of my favorite excursions was our annual school trip to the Griffith Observatory. A short hike from the famed Hollywood sign, the Observatory's Greek and Beaux-Arts inspired design was a utopian vision in the midst of the smog drenched and drought-charred landscape of the Hollywood hills. Inside we'd file past the foyer's Foucault Pendulum and cue up to watch the Tesla coil spew lightning, then enter into the hushed, simulated dusk of the planetarium. Once inside we'd plant our heads on the reclining headrests to gaze up at the dome's all encompassing, cobalt horizon. In the center, was the silhouette of a Zeiss Mark II Planetarium Projector that towered like a massive alien insect. The lights would dim and soon we'd journey through a celestial dream that remains vivid in my mind's eye.

As I got older, the Griffith Observatory's planetarium experience became a novelty with its midnight Pink Floyd laser shows, yet my early memories of galactic voyages remain imprinted. For years I've maintained a solar punk fantasy to repurpose a used Zeiss projector and build a sustainable haybale dome that could run on solar power to host raves and conferences. While this vision remains unfilled, I recently discovered a more ambitious use for planetariums. In 2019, while attending the [What is Universe? conference](#) in Portland, Oregon, participants were invited to join a special event in the [Kendall Planetarium at the Oregon Museum of Science and Industry](#). Settling into the comfortable womb of the planetarium, the lights dimmed and once again I was taken on a cosmological journey, this time through the "overview effect," a recreation of the sublime experience of seeing Earth from space. Immersed in world music, projected multimedia, video of space station flyovers, and animated data points showing the Earth pulsing with seasons and time, one immediately experiences the Earth as a living, breathing entity.

In the hands of artist [Kenji Williams](#), [Bella Gaia \(Beautiful Earth\)](#) combines live violin with world-music inspired soundtrack and projected graphics, animations and video, repurposing the planetarium for an ambitious goal: climate education. A hybrid of art and science, experiencing the emotional, nonlinear performance demonstrates an emerging form of

ecomedia in which remote sensing media are used to transform audiences to experience the Earth as an organic, living organism.

The phenomena of life changing awe that astronauts experience when seeing Earth from space has been coined as the overview effect by Frank White (2014). Such experiences, though limited to those who actually travel to space, are considered vital to engaging people in experiencing an emotional and profound connection with Earth. The effect is so sublime, scientists are currently experimenting with ways to achieve it with virtual reality (VR) headsets and floatation tanks (Sample, 2019). These simulations are part of a wider effort by artists and scientists to break the logjam of climate inaction by creating visceral, emotive experiences that connect data with experiential activities. In one example, [The Climate Music Project](#), artists composed music to accompany projections of climate data, satellite imagery, and other visualizations in order to stimulate emotional connections in audiences with Earth changes and to invoke a visceral response (Sheikh, 2019).

By using media to communicate about the environment and creating an immersive environment, *Bella Gaia* is a form of ecomedia pedagogy that expands people's consciousness about the state of and value of our environment. For over 10-years, Williams has been *Bella Gaia's* creative director and producer. As an organic, living work of art, various iterations have evolved to include the addition of live theater performances with dancers. Currently, he's experimenting with holograms, extended reality (XR), and VR. The violinist, composer and filmmaker incorporates a neuro-science driven methodology to create "immersive live theater, mixed reality, and interactive data visualization" (bellagaia.com). In past interviews, he has described his work as "bringing soul to data," a mix between Cirque du Soleil and Earth science. He collaborates with NASA to include updated visualizations that stay current with events and data. In addition to the actual experience of the show, the performance often includes add-on educational activities, such as hands-on workshops.

For this interview, I was interested in asking questions about what educators can learn from Williams' experience of developing *Bella Gaia*. The interview was conducted by email in December 2019. Williams lives and works in New York City.

Before reading the interview, it's recommended that you visit bellagaia.com and watch some of the videos in order to get a sense of the experience. To see a schedule of performances or find out where you can see a Fulldome movie in a planetarium, visit the website.

Lopez: *Understanding and experiencing the world as alive is a necessary paradigm shift that many need to have, but it's hard to convey the idea that Earth is alive through conventional educational approaches. How do you achieve this through Bella Gaia?*

Williams: The "how" starts with the name itself; Bella Gaia = Beautiful "interconnected Earth." Also, "Gaia" is originally the Greek Goddess of the Earth, or, "the Earth personified." NASA scientist James Lovelock coined the term Gaia to describe the Earth as a living organism. It is human nature to relate to something that is more personal, or tangible. Bella

Gaia does exactly this – it is an experiential tool used to personify and make tangible, the living Earth.

BELLA GAIA's creation was inspired by a story by Mike Fincke, an American Space Shuttle astronaut, who spoke of the profound transformation of perspective he had when he first looked out the window of the Space Station and saw our home planet. Arbitrary political boundaries melted away and the living bubble of life on Earth was dazzling, an outpost of life unlike any other planet we know of so far. BELLA GAIA has managed to accurately simulate the space flight experience according to many astronauts who have been to space. NASA invited the integration of scientific data visualizations from their top Earth scientists, and funded a 4-year Earth science education program to extend BELLA GAIA in workshop curriculum at science centers across the U.S. This program involved extensive surveys over 4 years, and revealed the transformative power of BELLA GAIA, showing 95% of audiences reporting a greater understanding of Earth systems after just one show, and more than doubling the number of people (31% to 64%) saying it was "very important to learn about the Earth and its importance to our lives, families and community" after one experience. This *personalization* of abstract biospheric systems is crucial, and has converted climate skeptics in one show, and 5 astronauts have affirmed the realism of BELLA GAIA's simulation of space flight.

Lopez: *How is Bella Gaia pedagogically different than a typical classroom? How do people learn differently?*

Williams: BELLA GAIA's method of communication science is more powerful than traditional outreach techniques to reach new audiences and actually transform them and generates the elusive but critical emotional response: A Reason to Care.

Scientists who have seen the live presentation have expressed afterwards that they were extremely moved and shocked by seeing their very own data visualized in such an emotional way. Synthesizing their visualizations with video and custom scored music had a profoundly different, and positive, effect on them even though they had seen this content presented hundreds if not thousands of times before. Adding the context of music, video and storytelling to their visualizations made them feel as if they were seeing their content for the very first time. BELLA GAIA's contextualizing of scientific visualizations-- in a larger audio/visual narrative of the Beautiful Earth-- provided a powerful and emotional way for the scientists to see their work, making it accessible and engaging for audiences to be immersed in a deep reflection on the many levels of interconnection throughout the Earth that allow life to flourish. This "Overview Effect" that helps us see beyond the narrow confines of our own subjectivity, and the biases of our particular cultures, lays a foundation for approaching the environmental and social problems of our time with head and heart.

The Anthropocene, birthed by the Scientific and Industrial Revolutions of the modern era, presents humanity with an overwhelming period of extremely fast and chaotic change for which many people are seemingly ill equipped to handle. The population explosion, and the unprecedented rate of technological evolution is flooding people and societies with a barrage of data and information-- pressing at us every minute of every day-- requiring us to make increasingly rapid decisions that may have repercussions for generations to come.

This is why it is so important to be able to communicate in a way that cuts through the noise and makes a difference, especially when exploring complex scientific and cultural issues with global audiences.

Lopez: *Describe for a lay audience what “neuroscience-driven methodology” means, and how did you arrive to this approach?*

Williams: Memorable experiences result from complex brain dynamics that allow people to interpret their experiences in ways that make meaning and make “worlds” we live and immerse within. Visual storytelling, conveyed through mediums such as video, music and voice, recruits the limbic/emotional brain that serves as the doorway and rudder to higher cognitive activities of the neo-cortex. Ignoring “emotional thought,” as neuroscientists Antonio Damasio and Mary Helen Immordino-Yang call it, constricts the potential for complex information to be absorbed by many people. People need an emotional connection to a subject for it to be engaging and meaningful to them. Endless litanies of doom and gloom about social and environmental change often cause people to tune out or feel hopeless. There is either no emotional connection to the information about today’s problems, or the only emotions evoked are ones of fear and disempowerment.

Lopez: *What have you learned from developing Bella Gaia that educators can take away?*

Williams: I feel much of our educational institutions feed the siloed nature of career paths and fragmented problem solving. Education and Science is too specialized, without having holistic knowledge and context of a wider scope. Technology and new education methodologies can help with bridging siloed worlds, to complement specialized education with at least a generalized context of differing and seemingly unrelated topics. Data visualization is the communication tool for this type of needed education. We need advanced visualization, in concert with digital storytelling and scored music, to help us quickly understand and digest concepts regarding the threats to our world, and how we may address these threats in ways that serve to renew ourselves, our cultures and the greater Earth community. Whether we are processing information to perform an action, communicating with others or in a learning environment, the artistry of developing data visualization into “a memorable experience” is now, out of necessity, evolving rapidly.

BELLA GAIA’s approach to looking at our current crisis is to first show and tell the splendor and interconnectedness of life on Earth. The great Jewish Rabbi Abraham Joshua Heschel once said that, “Mankind will not perish for want of information; but only for want of appreciation.” As our wonder and appreciation for our planet, and the relatives we share it with, expands, so will our desire to learn more about what needs to be done to preserve this cradle of life.

Communicating data in a holistic context through an emotional vehicle is the future of information science education. It opens up a new world (and vastly more complex one) of interrelationships of all activities on Earth. Storytelling brings soul to data and statistical information much like story stitches together disparate scenes of a movie. If you just show one scene with no audio it has very little impact and meaning. If you see the scene integrated into the movie as a whole, with story and sound, the experience is deeper and

immersive. Today, data visualization presents information visually, but the information is often presented in fragments, disconnected from its holistic context. Data visualization needs to integrate the micro and macro, the internal and external relationships of human existence and nature. So, then the question becomes not "what do we want to say?", but "how and in what context do we want to say it, and why?" If we see the data visualization of the stock market rise and fall, is this the full picture if we don't see next to it the stock of Co2 absorbing forests showing a near endless crash for the past few decades? And even if we see a visualization of deforestation, how is it being presented? Is it engaging "emotional thought," or is it just another graph? How is it being told, and why? And what are the causes of deforestation? Are they purely economic, or is it cultural? If we agree that we want humans to survive, we should present data visualization within a context of survival, whether explicit (through spoken or written language), or implicit (through artistic means like the key of music), and with the understanding that evolution, transformation, and change only occur when the interior and exterior evolve together.

Data visualization should improve our ability to understand the relationship between humans and nature by communicating information in a transformative way that translates facts into engaging memorable experiences, while also bridging disparate topics and stories. Emotion, through artistic use of story and music, is the vehicle that can make this happen so that people can more deeply engage with critical information about our world.

Lopez: *What was the original intention of your collaboration with NASA? Did they have specific educational goals and how did you bring your own insights as an artist to the project?*

Williams: My original intention was to first engage their top earth scientists at NASA Goddard. It was more just an emotional plea to scientists to wake up to change that was desperately needed in communicating science to the general public. I presented a live sample performance at a colloquium at NASA Goddard; It was a roomful of very frustrated scientists who pore over all this science data every day, who send out press releases, but they're frustrated because they feel it's not getting any traction or that people aren't listening. My value proposition was that science needs to be presented in a more engaging way, and BELLA GAIA provides that crucial platform. They were awestruck by the project and saying, "This is the missing link."

David Herring, a project manager at Goddard's Earth Sciences Division, said "*BELLA GAIA* is far more than a visual experience; it is a powerfully imaginative, emotional and cultural experience." I found a champion at NASA Goddard, Valerie Casasanto, who really pushed Bella Gaia forward within the ranks of NASA, and after two years of live presentations at 13 NASA events, and four education grant proposals attempts, BELLA GAIA was a "household name" within NASA Goddard. We won on the fourth try, receiving a \$500,000 grant from NASA's Earth Science Education Department. BELLA GAIA launched "Beautiful Earth" (<http://beautifulearth.gsfc.nasa.gov>), an innovative education program for K-12 students packaged together the BELLA GAIA live performance, with add-on education modules to take students deeper into earth science education. The modules included workshops with a NASA scientist, hands-on experiments, Native American scientists and educators providing

indigenous perspectives of Earth, and teacher development workshops on accessing and utilizing NASA Earth Science data.

Beautiful Earth reached over 22,000 participants including students, educators, and family members at 23 locations, nine live event locations and 12 Digital Learning Network (DLN) locations in the United States, and through DLN web and teen viewers through a Channel One TV partnership.

An evaluation conducted by an independent third party concluded that, “As a result of participating in the *Beautiful Earth* presentation, virtually all (98%) the participants demonstrated their understanding of the planet Earth had changed and were able to articulate one or more things new they had learned. Almost ALL participants (90%) indicated they thought addressing climate change challenges was ‘Important’ to ‘Very Important.’” The full report (available upon request) concluded, Beautiful Earth achieved and exceeded its target success indicator.

Beautiful Earth Foundation (<https://www.beautifulearthfoundation.net/>) was established to build upon these types of educational activities and social impact. Beautiful Earth can help produce immersive and inspiring eco-art, produce current environmental advocacy data, and sponsor educational tickets for schools and under-served communities to increase public access to inspiring eco-art and immersive experiences.

Lopez: *Bella Gaia reminds me of the phrase, “ancient-future.” It combines ancient forms of human expression—storytelling, music, dance—with futuristic remote sensing technology and computer-assisted visualization. Is that a fair characterization?*

Williams: Absolutely! BELLA GAIA is ancient-future in real-form – both literally, and philosophically.

First, the BELLA GAIA show experience in itself, is what might be called a “neo-indigenous ritual.”

Indigenous cultures throughout history have all had rituals to remind themselves of humanity’s relationship with the biosphere, and with the universe. Rituals were regular occurrences that were the core drivers of the responsible stewardship of nature, embedded in these indigenous cultures. In our modern western industrialist paradigm, this direct relationship with the Earth has been lost, or at best is translated into travel and adventure trips that all too often turn nature into another commodity, strengthening the capitalist relationship with the natural world.

BELLA GAIA is a new kind of ritual, that provides the communal space and context for people to gather, connect with each other, while also connecting on a deeper personal emotional way, an understanding of the natural world through technology and art. In this way, BELLA GAIA is a new kind of ritual, that reminds us of our place in the universe, much like indigenous rituals do, but without the tribalism, ethnocentrism, and exclusivity of organized religion. BELLA GAIA’s story is one of non-exclusivity and incorporates all cultures

and people on Earth in one experience and tells the story of how that is related to the biosphere that sustains all life.

A recent example was an augmented-reality Earth ritual in collaboration with NASA (<http://www.bellagaia.com/news/nasa-hologlobe-ceremony-icesat-2-launch>).

The NASA-sponsored live multimedia art and science program titled “Beautiful Earth,” an under the stars countdown for the ICESat-2 satellite launch, featured BELLA GAIA with the latest NASA data visualizations, remarks by Project Scientist Thorsten Markus, and a 'first of its kind' 'hold the Earth' augmented reality experience using HoloGLOBE (<http://www.palmyracove.org/instituteforearth-observations/hologlobe>).

Second, the live collaboration with an orbiting astronaut, Koichi Wakata, is a great example of an ancient-future experience:

Co-Sponsored by BELLA GAIA, this ‘StarJAM’ was an improvised musical performance between BELLA GAIA Director Kenji Williams and International Space Station Commander Koichi Wakata. (Watch here:

<http://www.bellagaia.com/press/may-2-fri-live-jam-with-astronaut-in-orbiting-space-station>)

One of these astronauts who contributed to BELLA GAIA was Koichi Wakata – who at the time I met him, was about to launch into space as Japan’s first Commander of the Space Station. It was a natural fit to do a live musical collaboration between earth and space.

Because Koichi was not a musician, I began designing/conceptualizing the project with the selection of an instrument that is uniquely Japanese, that does not require a lifetime of practice, and that could be transported in the small confines of a rocket module, and that would also not prove too problematic with the two-to-three second transmission delay to Earth, for the purpose of “jamming” with me live.

I selected the Sho – a two thousand-year-old Japanese wind instrument, normally played with a Gagaku orchestra, an ancient Imperial orchestra that many musicologists consider the oldest type of orchestra in the world. Tenri University in Japan was kind enough to donate the actual Sho instrument for Koichi to play.

Although we briefly trained Koichi Wakata on the Sho, he actually didn’t have a chance to practice it until he reached the space station. The Sho was transported separately to the Space Station by a SpaceX Dragon rocket. This is the first time in history for such an instrument to travel beyond the Earth's atmosphere, and because of the tight schedule, Koichi only had a couple days to practice in space.

In the Japanese Shinto tradition, the Sho is an instrument performed for the purpose of “tuning the cosmos.” The fact that Koichi was playing this instrument, literally in space, was a profound act – so I dedicated this live collaboration for the healing of all beings, healing of the Earth, healing of our friends and families. I was deeply moved as I improvised and played along with this beautiful sound transmitted from two hundred miles above.

References

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