

Data + Art: science and art in the age of information

Data + Art exhibit

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The intersection between science and art was displayed wonderfully at the Pasadena Museum of California Art's (PMCA) Data + Art exhibit. Curators and scientists Dan Goods and David Delgado from the nearby Jet Propulsion Laboratory (JPL) assembled a diverse array of pieces that highlight the innovation and creativity of the human mind. In our technologically savvy society, information is generated and gathered at staggering rates. Yet, we tend to think of data as dry charts and plots, but the Data + Art exhibit shows the beauty to be mined from our experience with nature and numbers. The diversity of the works celebrates the complexity of the human mind and our influence on the world around us. We are reminded of simpler beginnings by the organisms that seem simple and different, but that are so similar to us that we learn about ourselves by studying them. The exhibit suggests a place where humans fit into the greater landscape of all things, where we are influenced by it and exert our influence on it.

Images of tissue development in quail embryos show striking similarities to human embryogenesis, and thus, a small hole in a bird egg provides a window to understanding human development. Viktor Hamilton, the late and great developmental biologist said, 'Our real teacher has been and still is the embryo, who is, incidentally,

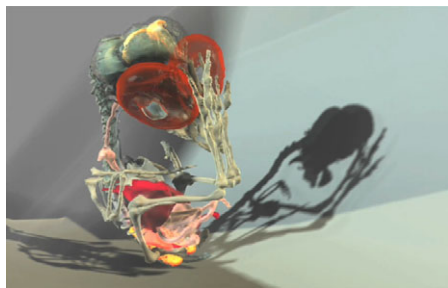


Fig. 1. *Quail Atlas* by Seth Ruffins and Rusty Lansford.

the only teacher who is always right.' By watching nerves that know just where to go and blood vessels moving in to feed new tissues, we learn about the signals that navigate the organization of new organisms. Similarities between these animals and ourselves allow us to use birds to understand human development and to model diseases as complex as cancer.

An extension of bird imaging studies resulted in the visually and audibly appealing piece, *Quail Atlas* by Seth Ruffins and Rusty Lansford (Fig. 1). Scientists composed an anatomical atlas of developing quail embryos by compiling magnetic resonance imaging (MRI) data. The atlas provides an illustrative reference for scientists, as well as an interactive database. Using an open-access format, researchers around the world can update the atlas, by adding their latest findings in gene regulation, and how it influences developmental form and function (<http://131.215.15.121/index.php>). *Quail Atlas* is a short video of beautiful images of quail embryos at different stages of development, exploring different tissues as they develop, and is set to music. One of the best segments in the video shows a 3D quail skeleton, while the camera view zooms through the frame, giving the viewer the sense that he is flying in and around the structure (Fig. 2). These models of embryonic human development give insight to our condition in the early phases of development. As man evolves in body and mind, so does his interpretation of the world around him.

Since we question and occasionally understand nature through science, many artists presented their translation of nature's hints into its mechanisms in a visual way. *Seismic Sea* by Ned Kahn is a water and light sculpture that begs interaction with the viewer. Small movements perturb the water and refracted light creates beautiful patterns on the wall. David Bowen's *Wind Drawing Device* uses leaves connected to charcoal to plot the wind direction and intensity on paper, reminding us that there is information to be gleaned directly from nature herself. Bowen's second piece *Phototropic Drawing Device* is more technologically advanced (Fig. 3). Solar-powered robots



Fig. 2. Artist and scientist Seth Ruffins standing in front of *Quail Atlas*.

armed with charcoal cruise across, marking the canvas, as dictated by timed lights.

Another work by Aaron Koblin, *In Flight Patterns*, interprets patterns, not from nature, but from man-made creations. Koblin's piece is a video that begins with blue-white sparks that scatter randomly across a black background. As the video progresses, the streaks emanate from punctate islands, and soon, it is easy to see that these streaks build a dynamic figure in the shape of the continental USA. By taking data from the U.S. Federal Aviation Administration, Koblin presents a visual graphic that shows flight patterns of different aircraft across the country throughout a given day. It's rewarding to watch data spots streak across the screen and discern for yourself hub cities such as New York, Chicago and Los Angeles.

Even more impressive, *10,000 Cents* by Aaron Koblin and Takashi Kawashima employs the work of thousands of people to reconstruct one of man's most valuable artifacts, money (a \$100 bill). Built piece by piece, *10,000 Cents* was one of the more resourceful and clever displays. An image of the \$100 bill was first subdivided into thousands of elements, each indiscernible as part of the original bill. Then, using Amazon's Mechanical Turk distributed labor tool and a custom drawing tool, workers were paid one cent to replicate one portion of the bill. The compiled work is fascinating, as the scaled-up \$100 bill reveals micro-printing, fibrous detail and the individual's sometimes comical interpretation of the original.

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Other works in the exhibit take everyday technology and present it with a fresh perspective. *Spam Architecture* by Alex Dragulescu is a print series of 3D models generated from junk e-mail, or spam. A custom computer program mines the e-mails for patterns in the text and converts them into 'gestures' in 3D modeling. The resulting pointy, angular and irregular shapes are fantastical, and one wishes that they had actually been constructed as real life 3D models. Similarly, both of Jonathan Berger's pieces *Jiyeh* and *Diagnostical Sonification* also employ data mining to represent the information in alternative fashions. Contour and conformation data from images of an oil spill in *Jiyeh*, Lebanon and tissue histology, respectively, were converted into musical notes and sounds, and composed into other-worldly songs.

Other pieces highlight the beauty of some of NASA's sample-gathering materials. Courtesy of JPL and Caltech, *Aerogel* and *The Genesis Mission Solar Wind Collector* were on display with descriptions of the materials' technical applications as sample collectors in space missions, and their various properties, such as translucency and insulation. The accompanying light show demonstrated the optical properties of the materials. Another JPL-Caltech piece, *First TV Image of Mars*, was created in 1964 by unwitting artists: the eager and anxious scientists on the Mariner 4 project. In light of the Mariner 3 mission that had failed previously, the scientists on Mariner 4 were so excited to see the first images of Mars that they took the raw data (in 8-bit intensity) as it was downloaded and proceeded to hand-construct and hand-color the first TV image of Mars. The original



Fig. 3. *Phototroptic Drawing Device* by David Bowen.

coloring sticks used for this endeavor were also on display and give the viewer the playful sense of 'I could do that'. *First TV Image of Mars* is a wonderful example of scientific history, developing technology and the enthusiasm that one can have for science.

Many of the art pieces present data in different manners to emphasize and highlight information. For instance, Chris Jordan's *Prison Uniforms* is a large multi-paneled installation depicting 2.3 million folded prison uniforms, equivalent to the number of people imprisoned in the USA in 2005. Jordan's piece is both sobering in size and intriguing in its capacity to truly hold 2.3 million uniforms. In his pieces *Breakfast*, *Lunch and Dinner* and *A Year of Sunsets*, Jim Bumgardner searched through the image libraries on Flickr for images related to meals or sunsets, respectively; extracted the digital time stamp data from the pictures; and plotted thumbnail images as a function of time of day. The 'maps' generated from these images were another way to visualize information, and some interesting information popped out, such as the volume of late-night diners. Another map on display was *Napoleon's March*, a diagram created by Charles Joseph Minard in 1869 in which he charted the decline of Napoleon's army in both time and by location. The map, presented in large scale, possesses beauty in both the scripted text and the multi-dimensional data presented.

One of the most fun and interactive pieces at the exhibit, which illustrates the application of technology in pop culture, is Koblin's *Radiohead: House of Cards* (Fig. 4). Lasers and sensors are used to generate 3D images in real time. The interactive display allows the viewer to cast and project him or herself onscreen in 4D (time being the fourth dimension) and experiment/play with body movements. This same technology was used in the band Radiohead's music video for 'House of Cards'. The many strengths of the Data + Art exhibit include its depiction of science and technology to the public in a way that is ingested easily and in a way that sparks interest, reflection and curiosity.

In multiple dimensions, few can compete with the complex panoply of the wiring of the human brain. With each thought, billions of cells burst, orchestrated by an unseen conductor, each speaking to its neighbor in an, as yet,

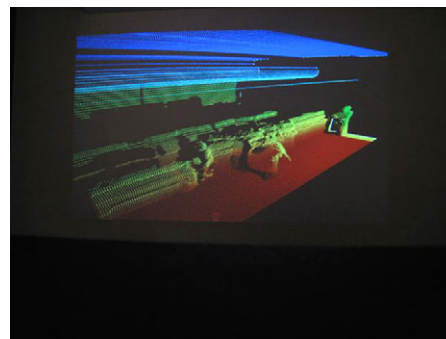


Fig. 4. *Radiohead: House of Cards* by Aaron Koblin.

unknown tongue. However, through their high-speed and high-throughput processes, those cells put our thoughts into words. Lastly, a beautiful example of data embedded in art is *The Rosetta Disk*, a part of the Rosetta Digital Language Archive and The Long Now Foundation's 10,000-Year Library, whose goals are to archive and preserve the world's languages (Fig. 5). The *Disk* itself is an aesthetic and technological marvel, with polished metal etched with nanoscale features and presented in a glass globe. On one side, it reads in eight of the major languages: 'Languages of the World: This is an archive of over 1,500 human languages assembled in the year 02008 C.E. Magnify 1,000 times to find over 13,000 pages of language documentation.' The text quickly spirals down from centimeter to nanoscale-sized font, and on the back of the disk, one finds over 13,000 pages; each page is a half a millimeter across and requires at least 650× magnification to read. This installation includes a computer and digital version of the 13,000 pages and is open for the viewer to peruse.



Fig. 5. *The Rosetta Disk* by the Rosetta Digital Language Archive and The Long Now Foundation's 10,000-Year Library.

The ability of *Rosetta Disk* and other works to relate, interact and engage with the viewer is what, in part, made the Data + Art exhibit a success. The proximity of PMCA to both JPL and Caltech surely assisted curators Dan Goods and David Delgado in collecting the best pieces for

the show and in pulling in an excited audience. Still, as technology advances, the public has been primed for an art exhibit that ties the science behind the technology they have grown up with back to themselves. The knowledge that we take away awakens us to the complex

interactions that we have forged with our environment. From manipulating large data sets to modeling human development, the creations displayed in Data + Art help advance the understanding of our surroundings and ourselves.