The STEAM Journal

Volume 1
Issue 1 *Luminare*

Article 23

March 2013

Just Beautiful Portrays of the Mind? The Relevance of Aesthetic Strategies on Knowledge Creation in Neuroscience

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STEAM is a bi-annual journal published by the Claremont Colleges Library | ISSN 2327-2074 | http://scholarship.claremont.edu/steam

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Abstract
We live in the age of big data. All types of data are being generated at an increasing rate but theories about the strategies and methods to visualize them is lagging. One of the main challenges we face today in research is to keep up with the massive amounts of data we produce (Allen, Elena A. et.al, 2012). Especially in the field of neuroscience and its use of imaging technologies, the vast array of data has risen to such a high number that it is impossible to grasp the inherent information without additional software tools and intelligent interfaces. Only through this are scientists able to select the relevant information from the generated data of the functional Magnetic Resonance Imaging (fMRI) or Positron Emission Tomography PET scans and decide which data should be shown and how.

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Keywords
Aesthetic Strategies, Knowledge Creation, Neuroscience, functional Magnetic Resonance imaging

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Valerie Kummer

We live in the age of big data.[1] All types of data are being generated at an increasing rate but theories about the strategies and methods to visualize them is lagging. One of the main challenges we face today in research is to keep up with the massive amounts of data we produce (Allen, Elena A. et.al, 2012). Especially in the field of neuroscience and its use of imaging technologies, the vast array of data has risen to such a high number that it is impossible to grasp the inherent information without additional software tools and intelligent interfaces. Only through this are scientists able to select the relevant information from the generated data of the functional Magnetic Resonance Imaging (fMRI) or Positron Emission Tomography PET scans and decide which data should be shown and how.

In the last few years the growing field of data visualisation has become more important in science. These methods of fusing art and science form a bridge between generating and understanding by revealing patterns, comparing different scales, showing correlations, making diagnoses and communicating the gained results within the scientific community or to a broader public (Frankel, 2002). Although the visualization of data is essential, little attention has been paid to the aesthetic and formal strategies that underlie the creation of these images. While there are numerous research papers about the process of image production and its impact on the society (Littlefield & Johnson, 2012) but less of them focus on design issues and new possibilities that rise with the use of different aesthetic and formal strategies to communicate the inherent information of data. The key question is: How to effectively translate the gained data into innovative visual representations to communicate

[1] In 2008 both journals, Nature and Wired had a special issue on the promises and challenges of big data in science. See: Nature 455, 30 (4 September 2008) and Wired, Petabyte Age, Issue 16/07, 2008.

and make the data set meaningful by selecting, sculpturing, highlighting and coloring? Can aesthetics be used as a tool in itself to foster greater understanding of the data?

Images in neuroscience can be aesthetically pleasing and visually stunning,[2] with informative aspects that are added that beauty becomes educational. Till the midth of the 19th century the view of the artist that selected, characterized, reduced the encountered to the essential was the guarantee of objectivity in science (Kemp, 2006). Neuroscientist Semir Zeki has created the term *neuroesthetics* to explain how neuroscience can be illuminated in the visual brain (1999). Art starts in the brain from visual ideas transplanted into real and tangible art. Communication is a vital aspect of art and neuroscience. STEAM can become a way that several aspects of theory can come together in the seemingly contrasting fields of art and neuroscience. The fields represented in neuroscience are closely tied to science, technology, engineering and mathematics, so STEM can clearly be seen in neuroscience and specifically in scanning technology. The addition of the A in STEM makes the STEM more accessible so STEAM can really act as a communication channel.

Data visualisation has become one key technique and communication medium within the scientific community to cope with the torrents of data. However, the way in which we see the brain has stayed nearly the same since the invention of PET in 1975.[3] That is why we have to foster cross-disciplinary research between scientists, graphic designers, engineers, data specialists or even visual artists to find new innovative ways to effectively translate data sets into cutting-edge visual representations to not only look but actually communicate better. Maybe we should take one step further and think of the creator and users of software tools for data vizualisation as artists. The field of neuroscience is advancing not just in terms of

[2] The *Brain-Art competition* was founded to „recognize the beauty and creativity of artistic renderings emerging from the neuroimaging community“ (http://www.neurobureau.org/BrainArt/Gallery2012.html) or the annual *Art of Neuroscience Competition* by the Netherlands Institute for Neuroscience.(http://aon.nin.knaw.nl/). Both competitions are based on other art/science events like the Olympus BioScapes International Digital Imaging Competition (http://www.olympusbioscapes.com/), Nikon's small world (http://www.nikonsmallworld.com/) and Princeton's Art of Science competitions (http://www.princeton.edu/artofscience/).

[3] Ter-Pogossian, Michel M., et.al.: A Positron-Emission Transaxial Tomograph for Nuclear Imaging (PET). Radiology. 114, Nr. 1, p 89–98. and Phelps, Michael E., et.al.: Application of Annihilation Coincidence Detection to Transaxial Reconstruction Tomography. J Nucl. Med. 16, Nr. 3, 1. p. 210-224.

technological progress but in reflection of the closeness to art. Zeki states that although art is subjective the appreciation of that art stems from neural organization that allows individuals to discuss, translate and study art though words.

The Californian surgeon Leonard Shlain has long been an art advocate and even goes as far as to state that scientific advances are often foreshadowed by artistic endeavors, for example the renaissance artist and architect Giotto's work on linear perspective laid the foundation for the intellectual climate that allowed scientists such as Kepler to discuss planetary orbits more than three centuries later (Shalin, 1991). Although his argument is not entirely unquestionable, one can imagine the subtle artistic aspects to data visualization does more than just current research but may lend itself to shaping future understanding of science. Future research into innovative visual communications may yield stronger connections between aesthetic values and scientific values of data.

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