

The Art of Science, the Science of Art

I am among those who think that science has great beauty.

—Marie Curie

There are many congruencies between the rigorous logic and the aesthetic of science. Here we explore the thesis that creative as well as analytical insights and processes are essential to success in cell biology research.



Inke Nāthke

Order from Chaos

Here is an actual scenario from the mid-1970s:

A scientist and a sculptor are having coffee, and the scientist says, “I so admire your work. While I have to think very technically, I know that your creativity must far surpass my own.” The sculptor retorts, “On the contrary! I have to think about all the technical details of my medium in order to generate anything beyond a lumpy mass. Your science requires the height of creativity in order to organize thinking around the chaos that is life.”

In fact, both have mastered materials and methods and both are masters at creating order from chaos. More recently, a clinical immunologist, when asked to distinguish between a scientist and an artist, concluded, “A scientist is someone who uses creativity to discover; an artist is someone who uses discovery to create.” Those trained in science and those trained in the arts both use logic and representation in their work.

Cell Biologists as Artists

Cell biology is one of the most visually striking areas of scientific research. Not only have images provided exciting insights into biomedical science, they have also revealed the spectacular beauty of the microscopic world of cellular structures and interactions. Beautiful microscopic images of cells have elicited universal enthusiasm and appreciation. So it seems surprising that some people still

perceive a divide between art and science. This is particularly strange when brain research has documented that in both pursuits, left brain and right brain are fully engaged, attending to the open-ended combination of imagination and knowledge required to interpret an image or provide an explanation.¹ Balancing rigor



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with imagination is a constant activity in all creative disciplines, including science. “Daydreaming” is a term not often encountered in scientific training, but daydreaming—free association—is imagination at work

and is likely to generate that new connection, that new model, that new explanation for the way some piece of the biological world works.

That a significant number of senior cell biologists are well known for their artistic projects is thus not a surprise. There are numerous examples of writers, painters, poets, photographers, and cinematographers among “hardcore” scientists. They report that doing science enhances doing art, and doing art enhances doing science. This phenomenon is, of course, not a recent one: Think Leonardo da Vinci, for example. A long-standing namesake organization, Leonardo (www.leonardo.info/isast/isastinfo.html), “serves the international arts community by promoting and documenting work at the intersection of the arts, sciences, and technology, and by encouraging and stimulating collaboration between artists, scientists, and technologists.”

Careers in Art, Art in Careers

Several career trajectories entail tangible combinations of creative and analytical skill sets. Some cell biologists choose to make a living in biological illustration or graphic design. The Association of Medical Illustrators, founded over 60 years ago, serves as a professional society for women and men engaged in representing biology as images for education and art. Many



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artists find inspiration in biology (think Georgia O'Keefe!). The consulting group SciCult (www.scicult.com), started in 2002 in the UK, serves as a network for art practitioners who either use or are inspired by science and technology.

Other scientists choose to make a living writing fiction or nonfiction, often with a scientist as the protagonist (the popular television series *Bones* is based on a series of books written by a forensic anthropologist). Another outlet for verbal artistic expression about science is the Human Genre Project (www.humangenreproject.com), which encourages spreading the word about human genomics through short stories, reflections, and poems. Creative expressions about the genome project and many other scientific areas are also found in Wikimedia Commons and even on YouTube.

In addition to scientists who are also renowned for their art, and to scientists who choose careers that combine art and science, there are the rest of us. Perhaps we think of our artistic passion as a hobby, as a way to relax, as a pleasurable dimension of our lives out of the laboratory, or as an aesthetic that we neglect when the next grant application is due. Neglect of this aspect of our talents is unlikely to improve our scientific output, however. Instead, nurturing creative outlets that demand their own attention to technical detail reinforces the types of thinking required to advance scientific knowledge, and may even deepen it.

Recognizing the Connection between Art and Science

The connection between the artistic and scientific is not lost on funding agencies, medical practitioners, professional societies, and some departments in traditional institutions. For example:

- The Wellcome Foundation in the UK promotes biomedical science to the public through the arts, funding interdisciplinary practice and collaborative partnerships in the arts, science, and/or education.
- The research program in music and medicine at Paracelsus Private Medical University in Salzburg, Austria, dispenses “medication in the form of music.”^{2,3} Indeed, the effects of music on brain function are well established.^{4,5}

- The American Society for Cell Biology hosts an annual Celldance competition with focus on the artistic nature of cells themselves. (See the 2008 winners at http://tiny.cc/celldance_winners.)
- Harvard University has a program in molecular visualization (<https://iwasa.hms.harvard.edu>) designed to assist researchers in using animations that enhance understanding of cell function.
- Princeton University has an annual Art of Science competition (www.princeton.edu/~artofsci/2009) that encompasses the biological and physical sciences.

What emerges from these observations about the connection between science and art is that we should not dismiss one or the other “side” as hard or soft, intellectual or intuitive. People combine creative and analytical attributes and talents in different proportions and use them to different degrees in what they do. The art of science, the science of art...we welcome hearing from ASCB members who blend the rigor and the aesthetics in their science. Sharing your thoughts and your efforts in future articles may encourage more of us to “daydream.” ■

—Caroline Kane and Inke Nöhke, for the Women in Cell Biology Committee

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Balancing rigor with imagination is a constant activity in all creative disciplines, including science.