3 Million Stories: The Art of Science

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Why Should Arts Programs Pay Attention to Scientists?

1) Scientists benefit professionally from participation in the arts
2) Artists, musicians and performers contribute directly to science and invention
3) Therefore, arts are quite literally essential to innovation
Adult Arts Avocations Correlate with Scientific Success

Compared with typical scientist, Nobel laureates are at least:

- 2X photographers
- 4X musicians
- 17X artists
- 15X craftsmen
- 25X writers
- 22X performers

Root-Bernstein, et al., 2008
Successful Scientists & Inventors Develop Useful Skills and Knowledge from Arts Participation

- Musical scientists duet (and do it) better
- Artistic scientists have more image to their imagination
- Crafty scientists are more handy
- Literary scientists have the making of pundits
- And performing scientists perform better
- Moreover, successful scientists know this!
Innovators (n = 235) Recommend Arts Training for STEM Students

• Would you recommend arts and crafts education as a useful or even essential background for a scientific or engineering innovator?

Alexis Carrel, the 1912 Nobel Laureate in Medicine or Physiology, "learned [as a child] the intricate stitching required for his [later surgical experiments] from the renowned lace makers of Lyon, one of whom was his mother."

Alexander Fleming Discovered Penicillin While Collecting Colored Microbes for His “Palette”
Dorothy Hodgkin, Nobel Laureate in Chemistry, Developed 3D Imagination
Louis de Broglie: Playing Violin
Suggested Harmonics of Electrons
Robert R. Wilson, Physicist/Sculptor Maintains that Creative Process Is Universal

• “In designing an accelerator I proceed very much as I do in making a sculpture. I felt that just as a theory is beautiful, so, too, is a scientific instrument --or that it should be. The lines should be graceful, the volumes balanced. I hoped that the chain of accelerators, the experiments, too, and the utilities would all be strongly but simply expressed as objects of intrinsic beauty” (Wilson, 1992, p. [website, not paginated]).

“One thing is clear: it is that there is much in common between what the creative artist does and what the scientist does” (Wilson, 1978, p. [website, not paginated]).
Artists Themselves Make Scientific Discoveries
Painter Abbott Thayer Discovered Camouflage and Its Principles
Artist Jonathan Kingdon’s Work on Guenons Earned Him a Position in Zoology at Oxford
Zoologist Desmond Morris’ “The Entomologist” (Becoming a bug to understand it!)
Wallace Walker
KALEIDOCYCLES
KEN SNELSON'S Tensegrity Sculptures

kenneth snelson
“twist, 1993”
tensegrity structure, 3/4
rostfreier stahl, verspannung,
druck und zug ausgleichend

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presented as meshing gears. The work w
Adelbert Ames II: Now Classic Perception Studies Earned Him Neurology Position
Composers Leopold Mannes and Leopold Godowskyky Invented Kodachrome Film
Composer George Antheil & Actress Hedy Lamarr Invented Frequency Hopping

Hedy Lamarr and George Antheil. Photo of Hedy Lamarr courtesy of the Academy of Motion Picture Arts & Sciences. Photo of George Antheil courtesy of the Estate of George Antheil.
Composer Lejaren A. Hiller, Jr.: Invented First Artificial Intelligence & Expert Systems Programs
Buckminster Fuller’s Geodesic Domes Solved Spherical Viruses Virus Structure (Art by Don Caspar)
And Harold Kroto’s Nobel Prize-winning “Buckminsterfullerenes”
Sculptor Patricia Billings Invented Geobond®, a Novel Construction Material
ArtScientist Todd Siler’
Fractal Fusion Reactor
Adam Brown and Bob Root-Bernstein: “Origins of Life Experiment 1.4” @ Synth-Ethic, Vienna 2011 & Ars Electronica, Linz 2011
Kingdon On Art As Science

• "Any drawing poses questions and problems that you have to solve. Drawing is a way of exploring. Scientists have lots of techniques. They make histograms, graphs and tables. These techniques are no different to drawing. **Drawing is just as scientific....**”

MIT Metallurgist Cyril Stanley Smith on Artistic Thinking In Science

”I have slowly come to realize that the analytic, quantitative approach I had been taught to regard as the only respectable one for a scientist is insufficient... the richest aspects of any large and complicated system arise from factors that cannot be measured easily if at all. For these, the artist’s approach, uncertain though it inevitably is, seems to find and convey more meaning.”

“Tools for Thinking”

1. Proprioceptive Thinking
2. Recognizing Patterns
3. Forming Patterns
4. Abstracting
5. Empathizing
6. Imagining
7. Playing
8. Observing
9. Modeling
10. Transforming
11. Analogizing
12. Synthesizing: Synaesthesia and Synosia
13. Dimensional Thinking
Time for a New Renaissance: Leonardo, Brunelleschi, Durer, Vesalius, Kepler...