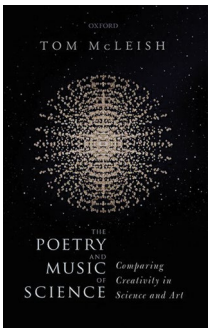
Creative ambiguity



The Poetry and Music of Science: Comparing Creativity in Science and Art

By Tom McLeish

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Most people would agree that making art is an inherently creative process. It takes a lot of hard work as well, but at its centre, there must be the spark of a previously unimagined insight that gives direction to the artist's labour.

In contrast, science is often thought of as a more methodical activity. The ideal of the scientific method is that you start with a hypothesis, design a way to test it, do the experiment, and then update the hypothesis in light of the results. A scientist is supposed to iterate this hyper-rational process until they understand the problem they are working on. Of course, modern science does not work exactly like this, but the caricature is good enough to illustrate the fundamental point of Tom McLeish's book *The Poetry and Music of Science*.

The crucial question that McLeish addresses — one that is typically not discussed when the classical scientific method is described — is how the scientist comes up with the hypothesis to test in the first place. Like the artist, they must arrive at the previously unimagined insight that guides their work, and there is a depth to this process that is not obvious at first sight. In addressing this question, McLeish takes his reader on a journey through classical, medieval, romantic and modern art and science, exploring similarities in the creative processes that drove the greatest painters, writers and scientists towards their accomplishments.

The most obvious place where there is commonality in the creative process is in the visual imagining of a mechanism or end goal. It isn't an accident that scientific discussions most frequently occur at a whiteboard — and that sketches, diagrams and mathematical symbols represent the ideas being exchanged in a way that words often fail to do. There is something deeply visual in the human brain that is active in this process and gaining intuitive insight into a scientific problem by visual metaphor is encapsulated in the phrase, "Ah, I see it now".

McLeish takes pains to explore the similarities between understanding nature through scientific models and artistic representation. He tells the story of a moment of visual insight that occurred to him during his own research. A protein will bind to a strand of DNA, but only when a signal molecule is attached to the other side of the protein. The mechanism for this selectivity was under investigation for several decades, but was not understood. McLeish recounts how, while attending a graduate school in soft-matter physics and molecular biology, a picture of the role of thermal fluctuations came to him: a 'movie in the mind'. After acquiring funding and collaborating with experimentalists, it turned out that this idea was a good description of the process, but the visual 'sight' of the key concept was crucial to understanding the problem. Similarly, visual art can explore what artist Vanessa Chamberlin calls "the boundary between representation and abstraction". The core idea of reality is encoded on a piece of canvas or etched out of a sculpture.

The high point of the book is the chapter that interrogates the role of emotion in scientific creativity. Many of the greatest pieces of art ever made were done in times of great anguish or joy. But the book contains testimony of several scientists — most notably Leo Esaki — who talk openly about the intuition, perception, love and struggle inherent in generating new scientific ideas. Even Einstein described his "anxious searching in the dark" and the "intense longing" as he was working on his theory of general relativity in 1915 — as well as the "final emergence into light" as it neared completion.

The links between the conscious and subconscious parts of the brain are clearly strong in this process, and McLeish includes a discussion of the *aspectus* and *affectus*, concepts originating in Christian thought in the middle ages and before. The *affectus* is the will, the desire, and overlaps strongly with the emotion. *Aspectus*, in contrast is something like the human intellect. Robert Grosseteste, a thirteenth-century scholar is quoted by McLeish:

> "Sight first looks; then it verifies what has been looked at or cognized, and when the fitting or harmful have been verified … desire trains to embrace the fitting, or … to shun the harmful."

So, medieval thinkers rationalized a feedback loop between *affectus* and *aspectus*: sight (*aspectus*) analyses, this in turn directs the desire (*affectus*), which goes on to motivate the intellect still further. McLeish claims that this is true of the scientific endeavour as much as it is of any other human pursuit.

The book is at its weakest when McLeish compares mathematics and music. Of course, there are plenty of parallels between number theory and geometry on one hand, and the form and organization of music on the other. There are also similarities between the performative aspect of live music, and the communication of scientific results both inside and beyond the scientific community. But as interesting as this discussion is, it never really gets to the nub of how this drives creativity and we don't learn a great deal about the central argument of the book.

An obvious strength of the writing is that there are a number of vivid descriptions of seminal pieces of physics that showcase McLeish's talent for communicating science. He uses detailed descriptions of subjects as diverse as the viscocity of polymer melts, the fluctuation–dissipation theorem, and fundamental parts of quantum mechanics and general relativity to illustrate the history of breakthroughs in scientific thinking. These are interwoven with equally lavish introductions of many works of art and personal experiences of artists. As McLeish oscillates between these two, they provide a welcome change of pace in the narrative and introduce readers to a wide range of culture and science.

McLeish's thesis is that there is universality to the creative process. This is as true for science as it is for any other human endeavour. Perhaps the scientific community can attempt to allow more space for this process and encourage researchers to take time to sit with ideas, play with visual metaphors, allow their subconscious brain to make intuitive links, and perhaps write fewer grant proposals. Who knows what mind-blowing creative acts might arise if we do. ❐

Reviewed by David Abergel
Associate Editor, Nature Physics.
e-mail: david.abergel@nature.com

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