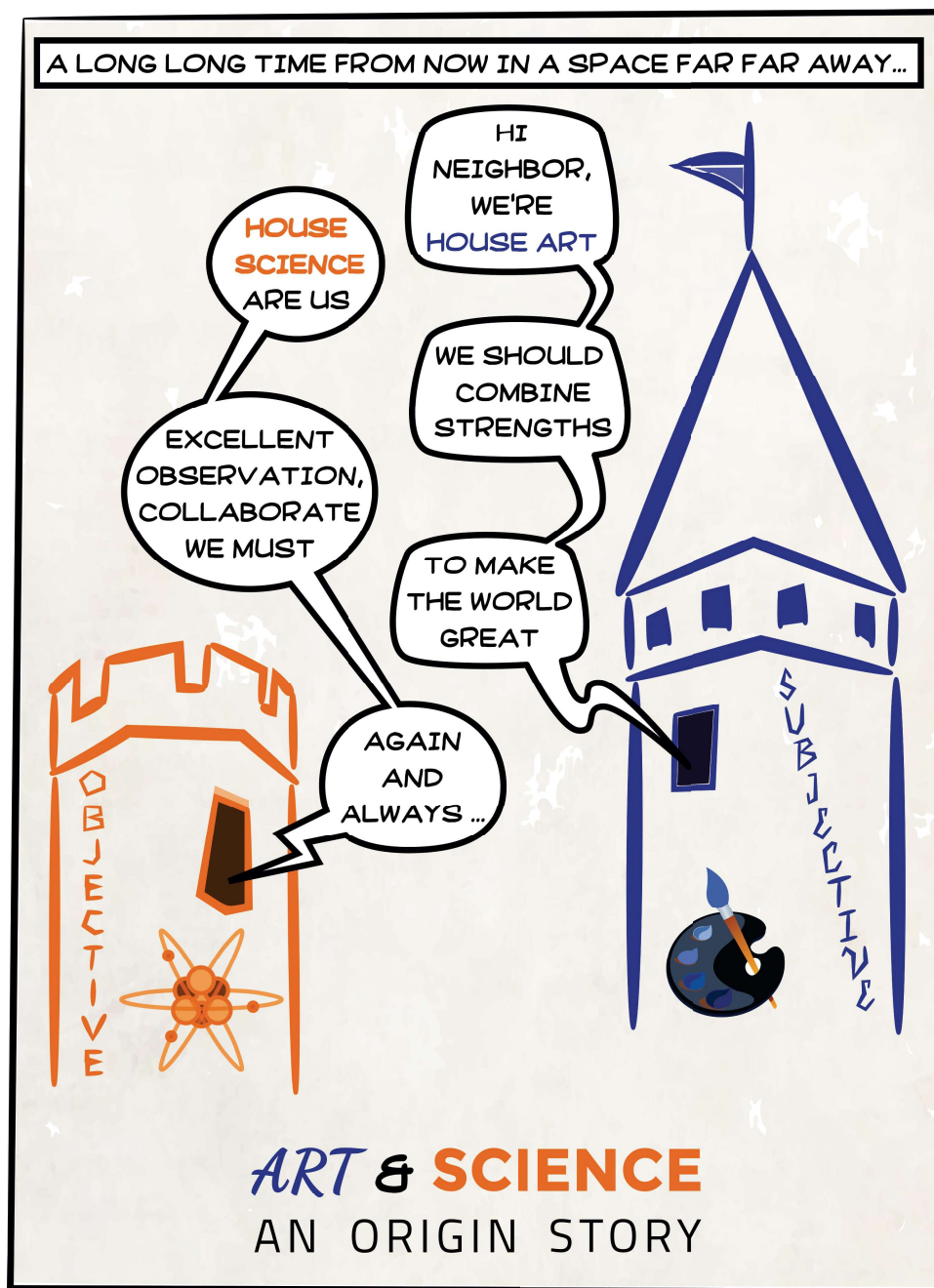


## A Tale of Art and Science



Science fair demonstrations are something that I always look forward to. I was there this other day at one such fair for gifted youngsters. I was demonstrating an experiment on densities. The experiment was quite a familiar one. The one where liquids with different densities do not mix. And where liquids with a lower value of density stay on top of liquids with larger densities, as distinct layers. To make it more vivid and interesting for the kids, I added a different color to each layer. A young boy came up to me after the demonstration and said...“It would be so boring if we did not invent colors to begin with”. His observation struck me and got me thinking. With our academic training in

Science, we take a lot of stuff for granted. We rarely stop to wonder at the beauty and artistry inherent in the everyday experiments that we do and in the things that are around us.

To the common demographic, scientists and artists will appear to be poles apart. The scientist being an objective individual driven by data. The artist, a subjective eccentric, swayed by waves of emotions. But this stereotype is quite artificial. The altars of Art and Science - the studio and the laboratory - still remain the only places without prejudice. The places where success and failure are treated as they should be, as lessons in figuring out answers to the perti-

ment questions of life. “What is true? Why does it matter? How can we move society forward? Why are we here? Where are we going?”

The artist and the scientist act as co-pilots when society takes the leap into the new and unknown. Any good story becomes great because of the storyteller. How much a scientist can enjoy a collaboration with an artist becomes apparent when there is a new scientific discovery. The natural propensity of an artist at communicating emotions makes him the perfect narrator. Even da Vinci acknowledged this when he said, “Art is the queen of all sciences communicating knowledge to all the generations of the world.”

So, Art and Science are nothing but two sides of the same currency that drive the engine of social progress. Carl Jung alluded to the synergistic expression of Art and Science in his ‘artist-scientist’.<sup>[1]</sup> In fact, research has found Nobel Laureates in science to be 17 times more likely to be a painter, 12 times to be a poet and 4 times a musician compared to an average scientist.<sup>[2]</sup> Funding agencies, like the Wellcome Trust,<sup>[3]</sup> have long tried to make artists and scientists collaborate.

The latest Nobel Prize in Chemistry highlights molecular machines.<sup>[4]</sup> These molecules reflect the artistic bent of mind of the scientists. And this relationship is not one-sided. Artists have contributed as much to science as well. The American painter, Abbot Thayer was behind the camouflage, now so ubiquitous in combat.<sup>[5]</sup> The art of Origami has provided inspiration for designing stents used in medicine as well as airbags in cars.<sup>[6]</sup>

Even though, we can find so many manifestations of the ‘artist-scientist’ in real life, still modern education seems to be treating Art and Science as two distinct and disparate disciplines. Such a perspective forebodes a future where the prophecy of Prof. Feynmann - “Scientific creativity is imagination in a straitjacket.” could well become the norm. To prevent such a grim future, the key of the arts is the only viable release.

Thus, I decided to go back and look through the archives of Art and Science to revisit the times when they complemented each other. A journey through history as old as humanity itself. From the paintings on ancient rocks in caves, to the pyramids and the magnificent temples of the far east, to the Renaissance, Art and Science have shared a long and evolving relationship.

The Greeks had a word for art - *Techné*.<sup>[7]</sup> The very same word which is at the root of modern interpretations of technology. An idea which, in this century, is very close to the ideal of science and research. And the literal antithesis of art, to begin with.

Now, any story of Art and Science will be incomplete the Renaissance. A time when society was gearing up towards

an intellectual upheaval after the regressive Dark Ages. A time when one of the greatest minds, Leonardo da Vinci, was making such accurate physiological and anatomical drawings of human form that it forever changed the landscape of visual art. One such example among his myriad drawings of the human form was *Sketch of Uterus with Foetus* (c. 1511-13).<sup>[8]</sup> The sketch is a reminder that Art and Science are two different paths to the same higher spiritual truth. A seminal contributor, also during this period, was Robert Hooke (1665), who through his passion to see the microscopic world, brought forth the idea of the ‘cell’.<sup>[9]</sup> The smallest functioning unit of ‘life’ and a representation of the mastery of Nature.

How an artist has manipulated the sense of motion and time can be found in Degas’ *Dancer (Large Arabesque)* (c.1882-95).<sup>[10]</sup> A bronze ballerina suspended in an eternal arabesque with its suggestion of motion and dynamism intriguing everyone for more than a century. It is only in this decade that science, like experimental psychology, has evolved which clearly reveals that the human mind and body get primed when it looks at such depictions of fluid movement.<sup>[11-12]</sup> The electrical conductivity of the skin and the heart rate generate a map of someone who is actually dancing.

Not only sculptures, the invention of synthetic colors paved a way forward for 19th century French artists. Up to then, colors like ultramarine blue were derived from *lapis lazuli*, a natural source. An expensive practice. Thus its use was restricted to divine representations or commissioned pieces from the nobility.<sup>[13]</sup> But now the colors were in the public domain. A fortunate accident which allowed artists, like Seurat, to develop techniques like Pointillism.<sup>[14]</sup> Seurat, like Degas in his sculptures, tried to play around with the perception of vision and color. A way where, when you zoomed in, you saw distinct points of color. But when viewed through the telescopic end, a sense of dynamic perception created through deft brushwork by clumping of complementary colors, afforded you the entire masterpiece. A brilliant example that combined the optical and color theories of his century and the century after was the piece *A Sunday Afternoon on the Island of La Grande Jatte* (1884).<sup>[15]</sup> The way how the masters of Pointillism seemed to trigger the sensation of a shimmering artwork, depending on where you looked at the painting and under what light, is still open to scientific speculation.<sup>[16]</sup> What is not beyond doubt, though, is the unanimous “Aha!” moment felt by all when they see the composition.

As one moves forward in the exploration of the intimate relationship between Art and Science into the 20th century, two epochal events prop up along the landscape. Two reclusive and eccentric characters, who would shape the earth of Art and Science for years to come. Pablo Picasso and Albert Einstein. In the first decade of the century, 1905 to be exact, Einstein engaged the scientific community with the Theory of Relativity.<sup>[17]</sup> A discovery that changed the

perceptions of the day. A theory that precluded and questioned the nature of reality and how one perceives it. Fast forward five years to 1910, and the world was challenged to rethink their perceptions yet again - this time, it was Cubism.<sup>[18]</sup> Picasso, in his masterpiece *Portrait of Daniel-Henry Kahnweiler*,<sup>[19]</sup> created an image replete with distinct elements, each with their many perspectives. Both Cubism and Relativity thrived as it played on the critical and sedulous analysis of the audience. They rewarded the enthralled with a sense of comprehension and realization.

The middle of the 19th century saw the invention of the photographic camera. A brilliant scientific and technological achievement. The culmination of years and even centuries of effort in capturing images permanently. An evolution of the *camera obscura*.<sup>[20]</sup> The exposing of light-sensitive metal plate or paper to fix the images revolutionized the way people began to think of paintings and of painters. Even though photography posed a challenge to the painters of the day, but with time, photography has evolved into an art form. A medium of painting with light. One of its great exponents was Ansel Adams. He played around with the juxtaposition of nature, art and technology to deliver timeless compositions of epic landscapes. The technical prowess and the creative brushstrokes is evident in his *The Tetons and the Snake River, Grand Teton National Park, Wyoming* (1942).<sup>[21]</sup> Photography has done away with the need for elaborate canvases to portray and capture our memories for posterity. And thus the words of Dorothea Lange truly resonate today, when everyone has access to a digital brush and canvas, "Photography takes an instant out of time, altering life by holding it still."

The ability to record and capture images with such ease and convenience has been instrumental to the advancement and understanding of science as well. The Princeton University Art of Science Exhibition is one such initiative.<sup>[22]</sup> The exhibition displays images conceived as part of scientific research. And it has opened the doorway to the artist to appreciate the aesthetics of science as well. (More about the exhibit in our feature in this issue.)

Science has not only provided inspiration through light, but through sound and chemical alchemy as well. Even music, so long thought to have no connections with science

cannot be farther from the truth. Music, itself, is nothing but a creative juxtaposition of a multitude of sound waves. Not only that, music also has a healing power, undiscovered before the last century. Indeed, Art and Science does amaze us all.<sup>[23]</sup> In the 21st century, artists have visualized the geometry in sound through the art of Cymatics.<sup>[24]</sup> To take it even a step further, scientists from Japan have succeeded in making three dimensional artwork with sound by overcoming the force of gravity itself.<sup>[25]</sup> Through careful manipulation of the process of crystallization, artist and scientist Tyler Thrasher (hear more about his passions when he spoke with us) has created works of art from seemingly 'lifeless' subjects.<sup>[26]</sup>

From creating Martian landscapes in the Atacama desert and fueling citizen science projects for next age space travels,<sup>[27-28]</sup> Art and Science seem to be more and more intertwined in the new century. It is also heartening to see the effect of creative arts on life sciences. Animation has given biologists the opportunity to visualize and design future experiments to understand proteins.<sup>[29]</sup> Such a union between Art and Science is not new though. It is old—as old as communication itself. Of a time before the discovery of any form of written language. Before there was any script, there were the cave paintings, with their myriad lines and marks. New research on cave paintings has revealed something quite extraordinary.<sup>[30]</sup> A form of graphical communication that has survived both space and time. From the western European caves in Spain and France to the holes in the ground in Australia and Indonesia separated by more than 30 millennia, these sites exhibit a drastic and eerie similarity in their symbols. These paintings could hold the key to the origins of communication out of Africa. The wonderful co-habitation of scientist and artist will surely deliver many more dividends.

During my long and rewarding exploration for this article, I have come to realise that Art and Science will always share a strong and at the same time strained relationship. A relationship where one complements and reinforces the other, a relationship that will endure through time and space again and always...

— Soham Roy

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